

**Ministry of Water Resources and Irrigation
US Agency for International Development
Agricultural Policy Reform Program
Environmental Policy and Institutional Strengthening Indefinite Quantity Contract**

**APRP – Water Policy Activity
Contract PCE-I-00-96-00002-00
Task Order 807**



***MATCHING IRRIGATION SUPPLIES AND DEMANDS
PILOT DISTRICT DATA REPORT***

***Report No. 45c
Beba District
Volume 1 of 2
February 2002***

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***MATCHING IRRIGATION SUPPLIES AND DEMANDS
PILOT DISTRICT DATA REPORT – BEBA***

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Environmental Policy and Institutional Strengthening Indefinite Quantity Contract (EPIQ)
Partners: International Resources Group, Winrock International,
and Harvard Institute for International Development
Subcontractors: PADCO; Management Systems International; and Development Alternatives, Inc.
Collaborating Institutions: Center for Naval Analysis Corporation; Conservation International; KNB Engineering and
Applied Sciences, Inc.; Keller-Bliesner Engineering; Resource Management International, Inc.;
Tellus Institute; Urban Institute; and World Resources Institute

1 Introduction

1.1 Overview

The Agricultural Policy Reform Program (APRP) is a United States Agency for International Development (USAID) grant program involving several ministries. The Ministry of Agriculture and Land Reclamation (MALR) is the primary Egyptian governmental agency charged with support of agricultural production. The Ministry of Water Resources and Irrigation (MWRI) has the prime management responsibility for Egypt's water resources. The MALR, MWRI and USAID, under the umbrella of the APRP, jointly designed an agricultural and water policy package, which consists of integrated policy and institutional reforms. USAID supports the ministries' efforts through annual cash transfers based on performance in achieving identified and agreed-upon policy reform benchmarks and technical assistance.

Technical assistance for the water policy analysis activity is provided through a task order (Contract PCE-I-00-96-00002-00, Task Order 807) under the umbrella of the Environmental Policy and Institutional Strengthening Indefinite Quantity Contract (EPIQ) between USAID and a consortium headed by the International Resources Group (IRG) and Winrock International. Local technical assistance and administrative support is provided through a subcontract with Nile Consultants.

1.2 Purpose of the Report

This report presents data collected as part of the activities of MWRI and MALR under the Tranche IV, C.1 Benchmark, which states:

The GOE (MWRI and MALR jointly) will establish a system that improves the flow of real-time information between the Ministries with respect to irrigation demands and supplies.

Satisfactory achievement of the BM required the accomplishment of two verification indicators:

1. A pilot program will be initiated by the MWRI and MALR in one irrigation district in each of two governorates for mutual information transfer for cropping patterns and calendars and water supplies by December 31, 2000.
2. A joint MALR/MWRI national policy for the application of the pilot program will be approved by the two Ministers by December 31, 2001.

The overall timeline for work on this BM is July 31, 1999 – December 31, 2001, which is divided into two phases:

- Phase I: July 31, 1999 – December 31, 2000
- Phase II: January 1, 2001 – December 31, 2001.

During Phase I, the two ministries successfully established a pilot program in five irrigation districts, in five different governorates involving four separate irrigation directorates covering Lower, Middle, and Upper Egypt. The APRP Water Policy Program Report No. 33 (December 2000) documented details of this pilot program. Further documentation of the

benchmark activities and results are given in APRP Water Policy Program Report No. 45 (December 2001).

This is a data report for the Beba pilot district covering the period from March 1, 2000, through September 30, 2001. It is one of five separate data reports – one report for each pilot irrigation district. The other four data reports (numbered 45a, 45b, 45d, and 45e) are for the other pilot districts: Abou Hummus, Abou Kebir, East Isna, and Luxor, respectively.

1.3 Organization of the Report

This report consists of this brief introduction, information about the district, information about the different data collected, calibration relationships, and data presented both as tables and graphs in the following chapters:

Chapter 2	Information about Beba Irrigation District
Chapter 3	Cropping pattern information
Chapter 4	Crop water needs Microsoft Excel district-level user's manual
Chapter 5	Crop water needs Microsoft Excel model administrator user's manual
Chapter 6	Crop water needs Microsoft Excel district calculation results
Chapter 7	Crop water needs Microsoft Access user's manual
Chapter 8	Crop water needs Microsoft Access district analysis
Chapter 9	Water-monitoring program

Included with this report are two IBM-compatible 3.5" floppy disks that contain the computer programs and data files used in this report. The computer programs are intended for use by district engineers involved in implementing the MISD policy and discharging their responsibilities related to improving water delivery to more closely match crop water demands. This report can be used as a handbook for districts new to the MISD concepts and processes. Disk 1 contains the Microsoft Excel-based versions of software. The specific contents of Disk 1 are:

1. A folder named "Egy" that has the FAO CLIMWAT weather records from 28 sites in Egypt listed in Table A-1 of Chapter 5.
2. The workbook named "Canal Demand" and its three associated cropping history files: "current", "expected", and "planting". Canal Demand uses the MALR cropping pattern information to calculate crop water needs for each half-month period.
3. The following data files:
 - a. "Crop Pattern – Beba" that contains the cropping pattern information for the Beba district obtained from MALR and used as input to Canal Demand.
 - b. "Crops & Needs – Beba" that contains results of calculations of crop water needs output from Canal Demand for the Beba district.
 - c. "DEMO – Beba" that is an Excel Workbook used for organizing and displaying the results of Canal Demand and comparing the crop water needs with water delivered to the Beba district.

Disk 2 contains the Microsoft Access-based versions of the software. The specific contents of Disk 2 are:

1. A compressed version of the Access tool in a file named "MISD_Tool.zip".

2. A file named “WinZip32.exe”. This is the program to be used to decompress the “.zip” file.

Note: When the “.zip” file is decompressed, it will extract the Microsoft Access tool software named “MISD_Tool.MDB”.

2 Information About Beba Irrigation District

2.1 Command Area and Overlap with MALR Districts

The Beba Irrigation District is one of four districts that constitute the South Beni Suef Inspectorate, one of two inspectorates of the Beni Suef Irrigation Directorate. The command area of the Beba Irrigation District is about 35,000 feddans. There are about 30,000 feddans irrigated from the Ibrahimia Canal on the west side of the Nile River, while about 5,000 feddans of newly reclaimed lands on the east side of the river are irrigated through pump stations. There is overlap of three agricultural administrations (Beba, Ihnasia, and Somesta) with the Beba Irrigation District.

2.2 Canal System

The Beba Irrigation District gets its water quota from two main sources, the Ibrahimia Canal on the west side of the Nile River and the four pump stations (Geziret Beba, Ghayyada, Okba, and Elzeneika) that take water directly from the Nile on the east side. Five major branch canals take water from the Ibrahimia Canal. These branches are Ahmed Pasha “South”, Gannabiet Ammar, Elsharahna “North”, Elsharahna “South”, and Ahmed Pasha “North”. Second order canals irrigate about 29% of the district command area, third order branch canals irrigate 41%, fourth order canals irrigate 23%, and fifth order canals irrigate 5%. The rest of the area is irrigated from the pump stations on the east side of the river.

The average second order canal length is about 5.3 km with 11 km maximum and 1.45 km minimum. The third order canal length averages about 5.78 km with 18.53 km maximum and 1.15 km minimum. The maximum length of the fourth order canals is about 2.43 km with 6.22 km maximum and 0.8 km minimum. These values for fifth order canals are about 1.5, 2.27, and 0.67 km, respectively.

2.3 Water Distribution System in the District

Water is allocated to the district based on a two-rotation system (7 days off and 7 days on). Water is allocated to the district on a water-level basis to maintain the target water levels at the key points along the canals. Therefore, monitoring of water levels is the focus of district work where the water level is recorded three times a day to ensure water arrival to all users at the targeted levels. Telemetry stations are installed on the head regulators of major branch canals to provide water level values on a two-hour basis. All five major branch canals have telemetry stations at their head regulators.

Figure 2-1. Location of the Beba Irrigation District in the Beni Suef Governorate.

3 Cropping Pattern Information

Table 3-1. Raw data on cropping pattern for Beba Irrigation District collected from March 1, 2000 through September 30, 2001, from file “Crop Pattern – Beba” on disk.

No	Canal	Area (feddan)	Existing Crop Pattern, 1 Mar 2000						Expected Crop Pattern, 16 Mar 2000							
			Garden	Wheat	Barsee	Cotton	Other	Fallow	Garden	Wheat	Barsee	Cotton	Others	Fallow		
1	G. Ammar	8273	99	3365	2480	650	1128	551	99	3365	2480	835	1128	366		
2	Ammar Elkeblia	5161	12	2271	1610	600	201	467	12	2271	1610	616	201	451		
3	Ahmad Basha N.	4543	374	1524	1905	200	169	371	374	1524	1905	494	169	77		
4	Ahmad Basha S.	6349	185	1872	2704	100	1259	229	185	1872	2704	333	1255	0		
5	Elsharahna N.	4293	176	1409	2307	0	396	5	176	1409	2307	4	396	1		
6	Elsharahna S.	911	142	283	413	0	73	0	142	283	413	0	73	0		
7	Pumps	2468	918	674	717	0	159	0	918	674	717	0	159	0		
8	Abou Romh	268	0	67	165	0	36	0	0	67	165	0	36	0		
No	Canal	Area (feddan)	Existing Crop Pattern, 16 Mar 2000						Expected Crop Pattern, 1 Apr 2000							
			Garden	Wheat	Barsee	Cotton	Other	Fallow	Garden	Wheat	Barsee	Cotton	Others	Fallow		
1	G. Ammar	8273	99	3365	2480	650	1128	551	99	3365	2480	1150	1128	51		
2	Ammar Elkeblia	5161	12	2271	1610	600	201	467	12	2271	1610	1171	97	0		
3	Ahmad Basha N.	4543	374	1524	1905	200	169	371	374	1524	1905	494	246	0		
4	Ahmad Basha S.	6349	185	1872	2704	100	1259	229	185	1872	2704	333	1255	0		
5	Elsharahna N.	4293	176	1409	2307	0	396	5	176	1409	2307	4	396	1		
6	Elsharahna S.	911	142	283	413	0	73	0	142	283	413	0	73	0		
7	Pumps	2468	918	674	717	0	159	0	918	674	717	0	159	0		
8	Abou Romh	268	0	67	165	0	36	0	0	67	165	0	36	0		
No	Canal	Area (feddan)	Existing Crop Pattern, 1 Apr 2000						Expected Crop Pattern, 16 Apr 2000							
			Garden	Wheat	Barsee	Cotton	Other	Fallow	Garden	Wheat	Barsee	Cotton	Others	Fallow		
1	G. Ammar	8273	99	3365	2480	1150	1128	51	99	3365	2480	1150	1128	51		
2	Ammar Elkeblia	5161	12	2271	1610	1171	97	0	12	2271	1610	1171	97	0		
3	Ahmad Basha N.	4543	374	1524	1905	494	169	77	374	1524	1905	494	169	77		
4	Ahmad Basha S.	6349	185	1872	2704	333	1255	0	185	1872	2704	333	1255	0		
5	Elsharahna N.	4293	176	1409	2307	4	396	1	176	1409	2307	4	396	1		
6	Elsharahna S.	911	142	283	413	0	73	0	142	283	413	0	73	0		
7	Pumps	2468	918	674	717	0	159	0	918	177	717	0	140	516		
8	Abou Romh	268	0	67	165	0	36	0	0	20	165	0	36	0		
No	Canal	Area (feddan)	Existing Crop Pattern, 16 Apr 2000						Expected Crop Pattern, 1 May 2000							
			Garden	Wheat	Barsee	Cotton	Other	Fallow	Garden	Maize	Barsee	Cotton	Others	Fallow		
1	G. Ammar	8273	99	3365	2480	1150	1128	51	99	1657	2480	1150	1128	1759		
2	Ammar Elkeblia	5161	12	2271	1610	1171	97	0	12	430	1610	1171	201	1737		
3	Ahmad Basha N.	4543	374	1524	1905	494	169	77	374	710	1905	494	169	891		
4	Ahmad Basha S.	6349	185	1872	2704	333	1255	0	185	540	2704	333	1259	1328		
5	Elsharahna N.	4293	176	1409	2307	4	396	1	176	530	2307	4	396	880		
6	Elsharahna S.	911	142	283	413	0	73	0	142	61	413	0	73	222		
7	Pumps	2468	918	674	717	0	159	0	918	177	717	0	140	516		
8	Abou Romh	268	0	67	165	0	36	0	0	20	165	0	36	47		
No	Canal	Area (feddan)	Existing Crop Pattern, 1 May 2000						Expected Crop Pattern, 16 May 2000							
			Garden	Barsee	Cotton	Other	Fallow	Garden	Maize	Barsee	Cotton	Others	Fallow			
1	G. Ammar	8273	99	2108	1150	1500	3416	99	32	1165	1150	776	5051			
2	Ammar Elkeblia	5161	12	1400	1171	411	2167	12	45	1420	1171	117	2396			
3	Ahmad Basha N.	4543	374	1820	494	234	1621	374	5	1500	494	193	1977			
4	Ahmad Basha S.	6349	185	2650	333	1313	1868	185	0	2300	333	435	3096			
5	Elsharahna N.	4293	176	2330	4	373	1410	176	55	2350	4	107	1601			
6	Elsharahna S.	911	142	350	0	136	283	142	32	300	0	57	380			
7	Pumps	2468	918	580	0	277	693	918	250	510	0	378	412			
8	Abou Romh	268	0	120	0	81	67	0	0	150	0	8	110			
No	Canal	Area (feddan)	Existing Crop Pattern, 16 May 2000						Expected Crop Pattern, 1 Jun 2000							
			Garden	Maize	Barsee	Cotton	Veget	Other	Fallow	Garden	Maize	Sunflo	Cotton	Vegeta	Others	Fallow
1	G. Ammar	8273	99	25	1133	1178	692	1047	4099	99	3866	0	1150	290	900	1968
2	Ammar Elkeblia	5161	10	39	1329	1223	167	17	2376	12	2037	0	1171	82	30	1829
3	Ahmad Basha N.	4543	382	0	1755	623	208	2	1573	374	2834	88	494	247	173	333
4	Ahmad Basha S.	6349	133	1	2608	267	344	1307	1689	185	4262	0	333	373	400	796
5	Elsharahna N.	4293	176	54	2334	18	278	0	1433	176	3731	0	0	385	0	1
6	Elsharahna S.	911	142	28	298	0	164	0	279	142	556	0	0	176	26	11
7	Pumps	2468	918	277	496	0	144	0	633	918	1302	0	0	95	89	64
8	Abou Romh	268	7	0	182	0	35	0	44	7	189	0	0	12	0	60

Table 3-1. (Continued).

No	Canal	Area (feddan)	Existing Crop Pattern, 1 Jun 2000							Expected Crop Pattern, 16 Jun 2000						
			Garden	Maize	Sunflow	Cotton	Veget	Other	Fallow	Garden	Maize	Sunflow	Veget	Cotton	Others	Fallow
1	G. Ammar	8273	94	3340	259	1176	700	871	1833	94	5104	259	733	1176	856	51
2	Ammar Elkeblia	5161	10	1794	0	1219	252	27	1859	10	3631	0	274	1219	27	0
3	Ahmad Basha N.	4543	382	2184	0	622	259	7	1089	382	3196	0	259	622	7	77
4	Ahmad Basha S.	6349	143	2723	0	318	367	1205	1593	143	4231	0	456	318	1201	0
5	Elsharahna N.	4293	183	2669	0	13	126	0	1302	183	3971	0	126	13	0	0
6	Elsharahna S.	911	159	557	0	0	139	0	56	159	613	0	139	0	0	0
7	Pumps	2468	922	1382	0	0	70	0	94	922	1476	0	70	0	0	0
8	Abou Romh	268	0	132	0	0	8	0	128	0	260	0	8	0	0	0
No	Canal	Area (feddan)	Existing Crop Pattern, 16 Jun 2000							Expected Crop Pattern, 1 Jul 2000						
			Garden	Cotton	Sunflow	Maize	Veget	Other	Fallow	Garden	Maize	Sunflow	Veget	Cotton	Others	Fallow
1	G. Ammar	8273	79	1174	296	4596	1018	967	143	79	4739	296	1018	1174	916	51
2	Ammar Elkeblia	5161	10	1216	8	2873	350	0	704	10	3576	8	350	1216	0	9
3	Ahmad Basha N.	4543	376	635	0	3267	184	4	77	376	3372	0	160	635	0	0
4	Ahmad Basha S.	6349	133	320	0	4341	345	1195	15	133	4356	0	345	320	1195	0
5	Elsharahna N.	4293	183	13	0	3800	291	5	1	183	3800	0	291	13	6	0
6	Elsharahna S.	911	157	0	0	678	76	0	0	157	678	0	76	0	0	0
7	Pumps	2468	923	0	0	1445	70	30	0	923	1445	0	70	0	30	0
8	Abou Romh	268	0	0	0	247	21	0	0	0	247	0	21	0	0	0
No	Canal	Area (feddan)	Existing Crop Pattern, 1 Jul 2000							Expected Crop Pattern, 16 Jul 2000						
			Garden	Cotton	Sunflow	Maize	Veget	Other	Fallow	Garden	Maize	Sunflow	Cotton	Others	Fallow	
1	G. Ammar	8273	79	1174	296	4739	1018	967	0	79	4837	296	1174	1887	0	
2	Ammar Elkeblia	5161	10	1216	8	3576	350	1	0	10	3676	8	1216	251	0	
3	Ahmad Basha N.	4543	376	635	0	3372	154	6	0	376	3456	0	635	76	0	
4	Ahmad Basha S.	6349	133	320	0	4356	345	1195	0	133	4451	0	320	1445	0	
5	Elsharahna N.	4293	183	13	0	3800	291	6	0	183	3891	0	13	206	0	
6	Elsharahna S.	911	157	0	0	678	0	0	76	157	698	0	0	56	0	
7	Pumps	2468	923	0	0	1445	70	30	0	923	1465	0	0	80	0	
8	Abou Romh	268	0	0	0	247	21	0	0	0	257	0	0	11	0	
No	Canal	Area (feddan)	Existing Crop Pattern, 16 Jul 2000							Expected Crop, 1 Aug 2000						
			Garden	Maize	Sunflow	Cotton	Veget	Other	Fallow	Garden	Maize	Cotton	Others	Fallow		
1	G. Ammar	8273	79	4837	296	1174	920	967	0	79	4837	1174	2183	0		
2	Ammar Elkeblia	5161	10	3676	8	1216	250	1	0	10	3676	1216	259	0		
3	Ahmad Basha N.	4543	376	3456	0	635	70	6	0	376	3456	635	76	0		
4	Ahmad Basha S.	6349	133	4451	0	320	250	1195	0	133	4451	320	1445	0		
5	Elsharahna N.	4293	183	3891	0	13	200	6	0	183	3891	13	206	0		
6	Elsharahna S.	911	157	698	0	0	56	0	0	157	698	0	56	0		
7	Pumps	2468	923	1465	0	0	50	30	0	923	1465	0	80	0		
8	Abou Romh	268	0	257	0	0	11	0	0	0	257	0	11	0		
No	Canal	Area (feddan)	Existing Crop, 1 Aug 2000							Expected Crop, 16 Aug 2000						
			Garden	Cotton	Maize	Other	Fallow	Garden	Maize	Cotton	Others	Fallow				
1	G. Ammar	8273	79	1174	4837	2183	0	79	4837	1174	2183	0				
2	Ammar Elkeblia	5161	10	1216	3676	259	0	10	3676	1216	259	0				
3	Ahmad Basha N.	4543	376	635	3456	76	0	376	3456	635	76	0				
4	Ahmad Basha S.	6349	133	320	4451	1445	0	133	4451	320	1445	0				
5	Elsharahna N.	4293	183	13	3891	206	0	183	3891	13	206	0				
6	Elsharahna S.	911	157	0	698	56	0	157	698	0	56	0				
7	Pumps	2468	923	0	1465	80	0	923	1465	0	80	0				
8	Abou Romh	268	0	0	257	11	0	0	257	0	11	0				
No	Canal	Area (feddan)	Existing Crop, 16 Aug 2000							Expected Crop, 1 Sep 2000						
			Garden	Cotton	Maize	Other	Fallow	Garden	Maize	Cotton	Others	Fallow				
1	G. Ammar	8273	79	1174	4837	2183	0	79	4682	1174	2183	155				
2	Ammar Elkeblia	5161	10	1216	3676	259	0	10	3551	1216	259	125				
3	Ahmad Basha N.	4543	376	635	3456	76	0	376	3281	635	76	175				
4	Ahmad Basha S.	6349	133	320	4451	1445	0	133	4256	320	1445	195				
5	Elsharahna N.	4293	183	13	3891	206	0	183	3771	13	206	120				
6	Elsharahna S.	911	157	0	698	56	0	157	673	0	56	25				
7	Pumps	2468	923	0	1465	80	0	923	1380	0	80	85				
8	Abou Romh	268	0	0	257	11	0	0	247	0	11	10				
No	Canal	Area (feddan)	Existing Crop, 1 Sep 2000							Expected Crop, 16 Sep 2000						
			Garden	Cotton	Maize	Other	Fallow	Garden	Maize	Barsee	Others	Fallow				
1	G. Ammar	8273	79	750	4596	1619	1229	79	1572	859	1455	4308				
2	Ammar Elkeblia	5161	10	1216	2987	361	587	10	1352	431	63	3305				
3	Ahmad Basha N.	4543	376	635	3297	190	45	376	2080	598	9	1480				
4	Ahmad Basha S.	6349	133	320	4356	451	1089	133	2633	320	172	3091				
5	Elsharahna N.	4293	181	0	3724	254	134	181	1055	2272	354	431				
6	Elsharahna S.	911	162	0	666	42	41	162	159	437	72	81				
7	Pumps	2468	931	0	1384	84	69	931	281	964	126	166				
8	Abou Romh	268	0	0	237	19	12	0	88	89	21	70				

Table 3-1. (Continued).

No	Canal	Area (feddan)	Existing Crop, 16 Sep 2000					Expected Crop, 1 Oct 2000				
			Garden	Barsee	Maize	Other	Fallow	Garden	Maize	Barsee	Others	Fallow
1	G. Ammar	8273	79	400	1800	1200	4794	79	680	1870	1700	3944
2	Ammar Elkebia	5161	10	610	1120	320	3101	10	550	1250	1000	2351
3	Ahmad Basha N.	4543	376	400	1230	98	2439	376	1300	1370	800	697
4	Ahmad Basha S.	6349	133	240	1840	59	4077	133	1250	1240	340	3386
5	Elsharahna N.	4293	181	600	1750	80	1682	181	880	1380	645	1207
6	Elsharahna S.	911	162	68	40	65	576	162	62	300	100	287
7	Pumps	2468	931	125	980	100	332	931	89	870	250	328
8	Abou Romh	268	0	50	140	30	48	0	27	65	52	124
No	Canal	Area (feddan)	Existing Crop, 1 Oct 2000					Expected Crop, 16 Oct 2000				
			Garden	Barsee	Maize	Other	Fallow	Garden	Maize	Barsee	Others	Fallow
1	G. Ammar	8273	78	1883	1308	2250	2754	78	573	2700	2138	2784
2	Ammar Elkebia	5161	14	798	1443	730	2176	14	1375	1543	804	1425
3	Ahmad Basha N.	4543	384	595	993	461	2110	384	450	1973	342	1394
4	Ahmad Basha S.	6349	137	1129	1022	401	3660	137	618	1702	396	3496
5	Elsharahna N.	4293	186	243	1752	704	1408	186	534	1851	1060	662
6	Elsharahna S.	911	162	11	221	250	267	162	2	297	210	240
7	Pumps	2468	931	149	144	454	790	931	11	557	412	557
8	Abou Romh	268	0	37	40	47	144	0	0	168	38	62
No	Canal	Area (feddan)	Existing Crop, 16 Oct 2000					Expected Crop, 1 Nov 2000				
			Garden	Barsee	Maize	Other	Fallow	Garden	Barsee	Others	Fallow	
1	G. Ammar	8273	78	2700	520	2120	2855	78	3500	2300	2395	
2	Ammar Elkebia	5161	14	1650	1100	750	1647	14	1970	860	2317	
3	Ahmad Basha N.	4543	400	2120	420	350	1253	400	2350	380	1413	
4	Ahmad Basha S.	6349	137	3200	422	350	2240	137	3673	450	2089	
5	Elsharahna N.	4293	186	1720	330	950	1107	186	2230	1110	767	
6	Elsharahna S.	911	162	290	12	230	217	162	380	170	199	
7	Pumps	2468	931	607	50	370	510	931	825	325	387	
8	Abou Romh	268	0	160	0	25	83	0	180	28	60	
No	Canal	Area (feddan)	Existing Crop, 1 Nov 2000					Expected Crop, 16 Nov 2000				
			Garden	Barsee	Other	Fallow	Garden	Wheat	Barsee	Others	Fallow	
1	G. Ammar	8273	78	3000	2200	2995	78	695	3500	2300	1700	
2	Ammar Elkebia	5161	14	1630	820	2697	14	500	1970	860	1817	
3	Ahmad Basha N.	4543	400	2050	350	1743	400	313	2350	380	1100	
4	Ahmad Basha S.	6349	137	3450	420	2342	137	560	3673	450	1529	
5	Elsharahna N.	4293	186	2120	950	1037	186	150	2230	1110	617	
6	Elsharahna S.	911	162	350	150	249	162	39	380	170	160	
7	Pumps	2468	931	750	250	537	931	87	825	325	300	
8	Abou Romh	268	0	160	25	83	0	10	180	28	50	
No	Canal	Area (feddan)	Existing Crop, 16 Nov 2000					Expected Crop, 1 Dec 2000				
			Garden	Barsee	wheat	Other	Fallow	Garden	wheat	Barsee	Others	Fallow
1	G. Ammar	8273	78	2963	1362	1764	2106	78	3137	3294	1764	0
2	Ammar Elkebia	5161	29	2333	1213	396	1190	29	2403	2333	396	0
3	Ahmad Basha N.	4543	462	2333	230	179	1339	462	1395	2362	324	0
4	Ahmad Basha S.	6349	195	3674	664	335	1481	195	2059	3712	383	0
5	Elsharahna N.	4293	181	2337	463	0	1312	181	1312	2337	463	0
6	Elsharahna S.	911	162	301	83	0	365	162	238	301	210	0
7	Pumps	2468	945	617	315	0	591	945	650	617	256	0
8	Abou Romh	268	0	130	29	0	109	0	94	130	44	0
No	Canal	Area (feddan)	Existing Crop, 1 Dec 2000					Expected Crop, 16 Dec 2000				
			Garden	Barsee	wheat	Other	Fallow	Garden	wheat	Barsee	Others	Fallow
1	G. Ammar	8273	87	3480	3159	1547	0	87	3159	3480	1547	0
2	Ammar Elkebia	5161	33	2448	2286	394	0	33	2286	2448	394	0
3	Ahmad Basha N.	4543	452	2297	1352	442	0	452	1352	2297	442	0
4	Ahmad Basha S.	6349	201	3796	1954	398	0	201	1954	3796	398	0
5	Elsharahna N.	4293	181	2462	1354	296	0	181	1354	2462	296	0
6	Elsharahna S.	911	162	370	305	74	0	162	305	370	74	0
7	Pumps	2468	945	647	707	169	0	945	707	647	169	0
8	Abou Romh	268	0	137	124	7	0	0	124	137	7	0
No	Canal	Area (feddan)	Existing Crop, 16 Dec 2000					Expected Crop, 1 Jan 2001				
			Garden	Barsee	wheat	Other	Fallow	Garden	wheat	Barsee	Others	Fallow
1	G. Ammar	8273	87	3480	3159	1547	0	87	3159	3480	1547	0
2	Ammar Elkebia	5161	33	2448	2286	394	0	33	2286	2448	394	0
3	Ahmad Basha N.	4543	452	2297	1352	442	0	452	1352	2297	442	0
4	Ahmad Basha S.	6349	201	3796	1954	398	0	201	1954	3796	398	0
5	Elsharahna N.	4293	181	2462	1354	296	0	181	1354	2462	296	0
6	Elsharahna S.	911	162	370	305	74	0	162	305	370	74	0
7	Pumps	2468	945	647	707	169	0	945	707	647	169	0
8	Abou Romh	268	0	137	124	7	0	0	124	137	7	0

Table 3-1. (Continued).

No	Canal	Area (feddan)	Existing Crop, 1 Jan 2001					Expected Crop, 16 Jan 2001				
			Garden	Barsee	wheat	Other	Fallow	Garden	wheat	Barsee	Others	Fallow
1	G. Ammar	8273	87	3480	3159	1547	0	87	3159	3480	1547	0
2	Ammar Elkeblia	5161	33	2448	2286	394	0	33	2286	2448	394	0
3	Ahmad Basha N.	4543	452	2297	1352	442	0	452	1352	2297	442	0
4	Ahmad Basha S.	6349	201	3796	1954	398	0	201	1954	3796	398	0
5	Elsharahna N.	4293	181	2462	1354	296	0	181	1354	2462	296	0
6	Elsharahna S.	911	162	370	305	74	0	162	305	370	74	0
7	Pumps	2468	945	647	707	169	0	945	707	647	169	0
8	Abou Romh	268	0	137	124	7	0	0	124	137	7	0
No	Canal	Area (feddan)	Existing Crop, 16 Jan 2001					Expected Crop, 1 Feb 2001				
			Garden	Barsee	wheat	Other	Fallow	Garden	wheat	Barsee	Others	Fallow
1	G. Ammar	8273	87	3480	3159	1547	0	87	3159	3480	1547	0
2	Ammar Elkeblia	5161	33	2448	2286	394	0	33	2286	2448	394	0
3	Ahmad Basha N.	4543	452	2297	1352	442	0	452	1352	2297	442	0
4	Ahmad Basha S.	6349	201	3796	1954	398	0	201	1954	3796	398	0
5	Elsharahna N.	4293	181	2462	1354	296	0	181	1354	2462	296	0
6	Elsharahna S.	911	162	370	305	74	0	162	305	370	74	0
7	Pumps	2468	945	647	707	169	0	945	707	647	169	0
8	Abou Romh	268	0	137	124	7	0	0	124	137	7	0
No	Canal	Area (feddan)	Existing Crop, 1 Feb 2001					Expected Crop, 16 Feb 2001				
			Garden	Barsee	wheat	Other	Fallow	Garden	wheat	Barsee	Others	Fallow
1	G. Ammar	8273	87	2130	3159	1547	1350	87	3159	2130	1547	1350
2	Ammar Elkeblia	5161	33	1498	2286	394	950	33	2286	1498	394	950
3	Ahmad Basha N.	4543	452	1747	1352	442	550	452	1352	1747	442	550
4	Ahmad Basha S.	6349	201	3146	1954	398	650	201	1954	3146	398	650
5	Elsharahna N.	4293	181	2462	1354	296	0	181	1354	2462	296	0
6	Elsharahna S.	911	162	370	305	74	0	162	305	370	74	0
7	Pumps	2468	945	647	707	169	0	945	707	647	169	0
8	Abou Romh	268	0	137	124	7	0	0	124	137	7	0
No	Canal	Area (feddan)	Existing Crop, 16 Feb 2001					Expected Crop, 1 Mar 2001				
			Garden	Barsee	wheat	Other	Fallow	Garden	wheat	Barsee	Others	Fallow
1	G. Ammar	8273	87	2130	3159	1547	1350	87	3159	2130	1547	1350
2	Ammar Elkeblia	5161	33	1498	2286	394	950	33	2286	1498	394	950
3	Ahmad Basha N.	4543	452	1747	1352	442	550	452	1352	1747	442	550
4	Ahmad Basha S.	6349	201	3146	1954	398	650	201	1954	3146	398	650
5	Elsharahna N.	4293	181	2462	1354	296	0	181	1354	2462	296	0
6	Elsharahna S.	911	162	370	305	74	0	162	305	370	74	0
7	Pumps	2468	945	647	707	169	0	945	707	647	169	0
8	Abou Romh	268	0	137	124	7	0	0	124	137	7	0
No	Canal	Area (feddan)	Existing Crop, 1 Mar 2001					Expected Crop, 16 Mar 2001				
			Garden	Barsee	wheat	Other	Fallow	Garden	wheat	Barsee	Cotton	Others
1	G. Ammar	8273	85	2556	3173	875	1584	85	3173	2556	923	875
2	Ammar Elkeblia	5161	33	1489	2286	333	1020	33	2286	1489	1020	333
3	Ahmad Basha N.	4543	452	1590	1352	442	707	452	1352	1590	707	442
4	Ahmad Basha S.	6349	201	3443	1954	370	381	201	1954	3443	381	370
5	Elsharahna N.	4293	181	2449	1354	296	13	181	1354	2449	13	296
6	Elsharahna S.	911	162	370	305	74	0	162	305	370	0	74
7	Pumps	2468	945	647	707	169	0	945	707	647	0	169
8	Abou Romh	268	0	137	124	7	0	0	124	137	0	7
No	Canal	Area (feddan)	Existing Crop, 16 Mar 2001					Expected Crop, 1 Apr 2001				
			Garden	Barsee	wheat	Other	Fallow	Garden	wheat	Barsee	Cotton	Others
1	G. Ammar	8273	85	2556	3173	1536	923	85	3173	2556	923	1536
2	Ammar Elkeblia	5161	33	1489	2286	333	1020	33	2286	1489	1020	333
3	Ahmad Basha N.	4543	452	1590	1352	442	707	452	1352	1590	707	442
4	Ahmad Basha S.	6349	201	3443	1954	370	381	201	1954	3443	381	370
5	Elsharahna N.	4293	181	2449	1354	296	13	181	1354	2449	13	296
6	Elsharahna S.	911	162	370	305	74	0	162	305	370	0	74
7	Pumps	2468	945	647	707	169	0	945	707	647	0	169
8	Abou Romh	268	0	137	124	7	0	0	124	137	0	7
No	Canal	Area (feddan)	Existing Crop, 1 Apr 2001					Expected Crop, 16 Apr 2001				
			Garden	Barsee	wheat	Other	Cotton	Fallow	Garden	wheat	Barsee	Cotton
1	G. Ammar	8273	85	2556	3173	1536	923	0	85	3173	2545	980
2	Ammar Elkeblia	5161	33	1195	2286	333	1314	0	33	2286	1195	1314
3	Ahmad Basha N.	4543	452	1590	1352	339	810	0	452	1352	1590	810
4	Ahmad Basha S.	6349	201	3443	1954	370	381	0	201	1954	3434	390
5	Elsharahna N.	4293	181	2449	1354	309	0	0	181	1354	2449	0
6	Elsharahna S.	911	162	370	305	74	0	0	162	305	370	0
7	Pumps	2468	945	647	707	169	0	0	945	707	647	0
8	Abou Romh	268	0	137	124	7	0	0	124	137	0	7

Table 3-1. (Continued).

No	Canal	Area (feddan)	Existing Crop, 16 Apr 2001					Expected Crop, 1 May 2001						
			Garden	Barseel	Other	Cotton	Fallow	Garden	Barseel	Cotton	Others	Fallow		
1	G. Ammar	8273	85	2100	1500	1043	3545	85	1800	1043	1600	3745		
2	Ammar Elkeblia	5161	33	930	350	1334	2514	33	735	1334	380	2679		
3	Ahmad Basha N.	4543	452	1120	340	810	1821	452	1080	810	351	1850		
4	Ahmad Basha S.	6349	201	3300	280	398	2170	201	3270	398	311	2169		
5	Elsharahna N.	4293	181	2420	309	0	1383	181	2330	0	320	1462		
6	Elsharahna S.	911	162	370	75	0	304	162	320	0	82	347		
7	Pumps	2468	945	640	180	0	703	945	610	0	189	724		
8	Abou Romh	268	0	135	8	0	125	0	110	0	10	148		
No	Canal	Area (feddan)	Existing Crop, 1 May 2001					Expected Crop, 16 May 2001						
			Garden	Barseel	Maize	Other	Cotton	Fallow	Garden	Maize	Barseel	Cotton	Others	Fallow
1	G. Ammar	8273	85	1500	250	1650	1043	3745	85	730	1100	1043	1650	3665
2	Ammar Elkeblia	5161	33	750	135	380	1334	2529	33	450	450	1334	380	2514
3	Ahmad Basha N.	4543	452	1000	400	351	810	1530	452	750	600	810	351	1580
4	Ahmad Basha S.	6349	201	1239	400	311	398	3800	201	950	1600	398	311	2889
5	Elsharahna N.	4293	181	2030	320	200	0	1562	181	530	1700	0	200	1682
6	Elsharahna S.	911	162	200	120	82	0	347	162	191	92	0	82	384
7	Pumps	2468	945	500	133	190	0	700	945	200	400	0	190	733
8	Abou Romh	268	0	100	20	10	0	138	0	60	70	0	15	123
No	Canal	Area (feddan)	Existing Crop, 16 May 2001					Expected Crop, 1 Jun 2001						
			Garden	Barseel	Maize	Other	Cotton	Fallow	Garden	Maize	Cotton	Others	Fallow	
1	G. Ammar	8273	85	900	650	1650	1043	3945	85	2600	1043	1650	2895	
2	Ammar Elkeblia	5161	33	420	360	380	1334	2634	33	1800	1334	380	1614	
3	Ahmad Basha N.	4543	452	620	620	351	810	1690	452	1385	810	351	1545	
4	Ahmad Basha S.	6349	201	1400	750	311	398	3289	201	1850	398	311	3589	
5	Elsharahna N.	4293	181	1500	487	200	0	1925	181	1321	0	200	2591	
6	Elsharahna S.	911	162	90	170	82	0	407	162	237	0	82	430	
7	Pumps	2468	945	320	185	190	0	828	945	545	0	190	788	
8	Abou Romh	268	0	50	50	15	0	153	0	80	0	15	173	
No	Canal	Area (feddan)	Existing Crop, 1 Jun 2001					Expected Crop, 1 Jun 2001						
			Garden	Barseel	Maize	Other	Cotton	Fallow	Garden	Maize	Cotton	Others	Fallow	
1	G. Ammar	8273	85	120	4166	2859	1043	0	85	4166	1428	1043	1551	
2	Ammar Elkeblia	5161	14	60	3062	691	1334	0	14	3062	491	1334	260	
3	Ahmad Basha N.	4543	454	80	2812	387	810	0	454	2812	501	776	0	
4	Ahmad Basha S.	6349	201	150	4603	997	398	0	201	4603	860	398	287	
5	Elsharahna N.	4293	167	20	2650	1456	0	0	167	3757	289	0	80	
6	Elsharahna S.	911	192	30	519	170	0	0	192	519	200	0	0	
7	Pumps	2468	972	40	1353	103	0	0	970	1353	145	0	0	
8	Abou Romh	268	1	10	251	6	0	10	1	251	6	0	10	
No	Canal	Area (feddan)	Existing Crop, 16 Jun 2001					Expected Crop, 1 Jul 2001						
			Garden	Maize	Other	Cotton	Fallow	Garden	Maize(s)	Maize	Others	Cotton	Fallow	
1	G. Ammar	8273	85	4166	2859	1043	120	85	4166	500	2359	1043	120	
2	Ammar Elkeblia	5161	14	3062	691	1334	60	14	3062	100	491	1334	160	
3	Ahmad Basha N.	4543	454	2812	387	810	80	454	2812	60	387	810	20	
4	Ahmad Basha S.	6349	201	4603	997	398	150	201	4603	100	997	398	50	
5	Elsharahna N.	4293	167	3757	356	0	13	167	3757	40	289	0	40	
6	Elsharahna S.	911	192	519	200	0	0	192	519	0	200	0	0	
7	Pumps	2468	970	1353	145	0	0	970	1353	0	145	0	0	
8	Abou Romh	268	1	251	6	0	10	1	251	10	6	0	0	
No	Canal	Area (feddan)	Existing Crop, 1 Jul 2001					Expected Crop, 16 Jul 2001						
			Garden	Maize	Maize	Other	Cotton	Fallow	Garden	Maize(s)	Maize	Others	Cotton	Fallow
1	G. Ammar	8273	85	4166	800	2179	1043	0	85	4166	800	2179	1043	0
2	Ammar Elkeblia	5161	14	3062	320	431	1334	0	14	3062	320	431	1334	0
3	Ahmad Basha N.	4543	454	2812	270	197	810	0	454	2812	270	197	810	0
4	Ahmad Basha S.	6349	201	4603	380	767	398	0	201	4603	380	767	398	0
5	Elsharahna N.	4293	167	3490	245	391	0	0	167	3490	245	391	0	0
6	Elsharahna S.	911	192	519	10	190	0	0	192	519	10	190	0	0
7	Pumps	2468	972	1353	83	60	0	0	972	1353	83	60	0	0
8	Abou Romh	268	1	251	10	6	0	0	1	251	10	6	0	0
No	Canal	Area (feddan)	Existing Crop, 16 Jul 2001					Expected Crop, 1 Aug 2001						
			Garden	Maize	Maize	Other	Cotton	Fallow	Garden	Maize(s)	Maize	Others	Cotton	Fallow
1	G. Ammar	8273	85	4166	950	2029	1043	0	85	4166	500	2029	1043	450
2	Ammar Elkeblia	5161	8	3062	480	277	1334	0	8	3062	80	277	1334	400
3	Ahmad Basha N.	4543	454	2812	320	147	810	0	454	2812	70	147	810	250
4	Ahmad Basha S.	6349	201	4603	400	747	398	0	201	4603	100	747	398	300
5	Elsharahna N.	4293	167	3490	300	336	0	0	167	3490	50	336	0	250
6	Elsharahna S.	911	182	519	55	155	0	0	182	519	25	155	0	30
7	Pumps	2468	972	1353	100	43	0	0	972	1353	40	43	0	60
8	Abou Romh	268	1	251	10	6	0	0	1	251	10	6	0	0

Table 3-1. (Continued).

No	Canal	Area (feddan)	Existing Crop, 1 Aug 2001						Expected Crop, 16 Aug 2001					
			Garden	Maise	(Maize	Other	Cotton	Fallow	Garden	Maize(s)	Maize	Others	Cotton	Fallow
1	G. Ammar	8273	85	4166	430	998	1039	1555	85	4166	430	998	1039	1555
2	Ammar Elkebia	5161	8	2889	90	580	1255	339	8	2889	90	580	1255	339
3	Ahmad Basha N.	4543	454	2812	55	446	776	0	454	2812	55	446	776	0
4	Ahmad Basha S.	6349	201	4600	90	770	406	282	201	4600	90	770	406	282
5	Elsharahna N.	4293	167	3491	40	515	0	80	167	3491	40	515	0	80
6	Elsharahna S.	911	182	489	70	170	0	0	182	489	70	170	0	0
7	Pumps	2468	972	1323	30	143	0	0	972	1323	30	143	0	0
8	Abou Romh	268	1	234	10	23	0	0	1	234	10	23	0	0
No	Canal	Area (feddan)	Existing Crop, 16 Aug 2001						Expected Crop, 1 Sep 2001					
			Garden	Maise	(Maize	Other	Cotton	Fallow	Garden	Maize(s)	Maize	Others	Cotton	Fallow
1	G. Ammar	8273	85	4166	430	998	1039	1555	85	3500	430	998	3260	
2	Ammar Elkebia	5161	8	2889	90	580	1255	339	8	2200	90	580	2283	
3	Ahmad Basha N.	4543	454	2812	55	446	776	0	454	2400	55	446	1188	
4	Ahmad Basha S.	6349	201	4600	90	770	406	282	201	4250	90	770	1038	
5	Elsharahna N.	4293	167	3491	40	515	0	80	167	3200	40	515	371	
6	Elsharahna S.	911	182	489	70	170	0	0	182	420	70	170	69	
7	Pumps	2468	972	1323	30	143	0	0	972	900	30	143	423	
8	Abou Romh	268	1	234	10	23	0	0	1	160	10	23	74	
No	Canal	Area (feddan)	Existing Crop, 1 Sep 2001						Expected Crop, 16 Sep 2001					
			Garden	Maise	(Maize	Other	Fallow	Garden	Maize(s)	Maize	Others	Fallow		
1	G. Ammar	8273	85	3000	430	998	3760	85	2000	430	998	4760		
2	Ammar Elkebia	5161	8	2000	90	580	2483	8	1000	90	580	3483		
3	Ahmad Basha N.	4543	454	2200	55	446	1388	454	2000	55	446	1588		
4	Ahmad Basha S.	6349	201	4000	90	770	1288	201	3500	90	770	1788		
5	Elsharahna N.	4293	167	3000	40	515	571	167	2000	40	515	1571		
6	Elsharahna S.	911	182	400	70	170	89	182	300	70	170	189		
7	Pumps	2468	972	1000	30	145	321	972	500	30	145	821		
8	Abou Romh	268	1	150	10	43	64	1	100	10	43	114		
No	Canal	Area (feddan)	Existing Crop, 16 Sep 2001						Expected Crop, 1 Oct 2001					
			Garden	Maise	(Maize	Other	Fallow	Garden	Barseer	Maize	Others	Fallow		
1	G. Ammar	8273	85	1800	430	998	4960	85	850	430	700	6208		
2	Ammar Elkebia	5161	8	1200	90	580	3283	8	550	90	450	4063		
3	Ahmad Basha N.	4543	454	950	55	446	2638	454	450	55	350	3234		
4	Ahmad Basha S.	6349	201	2800	90	770	2488	201	800	90	500	4758		
5	Elsharahna N.	4293	167	1250	40	515	2321	167	550	40	430	3106		
6	Elsharahna S.	911	182	150	70	170	339	182	75	70	150	434		
7	Pumps	2468	972	350	30	140	976	972	250	30	120	1096		
8	Abou Romh	268	1	65	10	41	151	1	25	10	38	194		

4 Crop Water Needs Microsoft Excel District-Level User's Manual

4.1 Introduction

A simple model has been developed for estimating daily average irrigation water requirements and canal discharge requirements in all branch canals within an irrigation district. Model outputs will serve three purposes. First, they will be used in forecasting regional and national irrigation water requirements. Second, they will provide detailed information to district and directorate personnel responsible for managing and monitoring branch canal releases. Third, the model will provide a mechanism for developing long-term records of cropping patterns, cropping calendars and canal water requirements.

The model will utilize MALR cropping pattern and calendar data. It is anticipated that these MALR data will be compiled semi-monthly and will have been recorded in a spreadsheet format (Excel). The model is designed to import these spreadsheets directly. Users of the model at the district level are not required to provide any inputs other than the MALR data. Additional data are needed at the time the model is installed and initialized in a particular district by a supervising engineer, but these additional inputs will not be required again in the course of normal model operations.

Computation of water requirements and canal discharge requirements for all branch canals within a district is virtually instantaneous. The resulting estimates of average daily water requirements for all branch canals can be transferred immediately to the Directorate level to be used in estimating regional irrigation water requirements. The estimates of canal discharge requirements can be used within the district to assist the District Engineer and others in management of canal operations.

4.2 Background on the Model

4.2.1 Time Intervals

The intervals of time used in the analyses are half-month periods. The length of each period will be 15 or 16 days, except for the last half of February, which will be 13 days. Periods are numbered from 1 to 24, beginning with the first half of January (Period 1) and ending with the last half of December (Period 24). The ‘current’ and ‘expected’ periods are defined with reference to the half-month interval during which the cropping survey is prepared:

- *Current* period: the half-month during which the cropping survey is compiled.
- *Expected* period: the next half month following the current period.

4.2.2 Initializing the Program

The program will be installed and periodically monitored by a Ministry level professional responsible for overseeing the use of the model. The model supervisor will need assistance from the District Engineer to develop five sets of inputs for model setup and initialization: (i) a list of the crops that dominate total rates of water use in the district (generally those that cover the largest irrigated areas); (ii) a list of all canals that need to be included in the analysis; (iii) a mapping of the linkages of these canals that indicates all connections between primary, secondary and tertiary canals; (iv) a preliminary matrix of canal rotations that

indicates which canals receive water in each rotation; and (v) the duration of each rotation and intervals between rotations.

4.3 Loading the Program

The program will have been installed as an Excel Workbook entitled *Canal Demand*. The following procedure initiates operation:

- a) load Excel
- b) go to the Directory entitled *Canal* and open the workbook titled *Canal Demand*
- c) you will be asked if you want to *Disable Macros* or *Enable Macros*. Select *Enable Macros*

Sheet 1 of the workbook should be displayed. If another sheet is displayed, select the *Sheet 1* tab on the bottom of the screen.

The Sheet 1 worksheet is used to enter the MALR input data used by the model. For routine model operation the user need only enter the areas planted in individual crops for each canal and the number of the current period. The model is then executed in two stages, using CTRL keystrokes to activate Visual Basic macros. The macros are computer programs that run in the background. The first macro uses the data in Sheet 1 to compute daily average crop water requirements associated with each canal in the district. The second macro then computes the canal discharges required to meet those crop water requirements.

The user should understand the distinction between daily average crop water requirements and canal discharge requirements. Crop water requirements associated with a given canal are the daily *average* water requirements for all irrigated areas served directly by that canal. Canal discharge requirements refer to the rates of discharge in the canal required to deliver the necessary water during the interval of time the canal is actually operated in a rotation. Canal discharge requirements will generally be greater than daily average water requirements because:

- (i) Canals operating in rotation are only carrying water for a fraction of the total rotation cycle time, so the instantaneous delivery rate during operation will necessarily be greater than average rate.
- (ii) The required discharge to some canals will include water conveyed by that canal to another canal, unrelated to the irrigated areas served directly by the primary canal.

4.4 Entering Data and Running the Program

4.4.1 Preparing the input file

The period number is entered in cell C2 of Sheet 1. The MALR crop survey data are either typed directly into the spreadsheet or copied from another spreadsheet into the Sheet 1 template. Figure 4-1 shows a template of Sheet 1 before any data entry. Figure 4-2 shows the same Sheet 1 with data entry complete.

If a file is to be copied into Sheet 1 rather than typed in directly, it must be set up with the exact data positioning shown in Figure 4-2. The data can then be loaded into Sheet 1 using the *Cut* and *Paste* keys in Excel. It should be re-emphasized that if a file is to be cut and pasted into Sheet 1, the row and column positioning of the data must coincide exactly with the format shown. The Excel workbook version of the model also requires that zeros be represented literally, *i.e.*, as the number zero, rather than as a blank.

Figure 4-1. Sheet 1

Input Spreadsheet

Period	Canal	No.	Name	Current and Expected Cropping Pattern in Abou Houmos District												Water Requirements (m^3/dy)									
				Total area	Barley	Beans	Wheat	Veget.	Garde	Cotton	Prep	Rice	Maize	Fallow	Barley	Beans	Wheat	Veget.	Garde	Cotton	Prep	Rice	Maize	Fallow	
	1 Elkamaheen	4861																							
	2 Elzarka	3584																							
	3 Elherfa	7959																							
	4 Besntway	3295																							
	5 Seaf Aideen	515																							
	6 Elahkar	420																							
	7 G. Kabeel	380																							
	8 Kafia	3709																							
	9 Elkarakwy	1811																							
	10 Elgaradat	1307																							
	11 Elnakhla	1191																							
	12 Sahaly	1602																							
	13 G.sahaly	1102																							
	14 Khadra	240																							
	15 Hamdy	305																							
	16 Zawet Naem	1775																							
	17 Berket Attas	2476																							
	18 Gnady Kafazzazy	1566																							
	19 Elhamamy	3811																							
	20 Elsharkawa	1845																							
	21 Eldekhla	4235																							
	22 Elwzara	2140																							
	23 Elkenawia	8606																							
	24 Abou tahon	3105																							
	25 Elzeny	4189																							
	26 Elkasida	490																							
	27 Mahlit Keel	4159																							
	28 Koom Elbous	2350																							
	29 Sidi Azab	1690																							

Figure 4-2. Sheet 1

Import MALR spreadsheet

Period	Canal	No.	Name	Current and Expected Cropping Pattern in Abou Houmos District												Water Requirements (m^3/dy)								
				Total area	Barley	Beans	Wheat	Veget.	Garde	Cotton	Prep	Rice	Maize	Fallow	Barley	Beans	Wheat	Veget.	Garde	Cotton	Prep	Rice	Maize	Fallow
	1 Elkamaheen	4861		0	0	0	505	0	1836	0	1546	554	420	0	0	0	525	0	1836	0	1846	654	0	
	2 Elzarka	3584		0	0	0	360	55	1333	0	1040	375	421	0	0	0	381	55	1333	0	1340	475	0	
	3 Elherfa	7959		0	0	0	753	0	3006	0	2522	672	1006	0	0	0	859	0	3006	0	3022	1072	0	
	4 Besntway	3295		0	0	0	240	100	1207	0	1013	330	405	0	0	0	345	100	1207	0	1213	430	0	
	5 Seaf Aideen	515		0	0	0	55	0	195	0	166	52	47	0	0	0	55	0	195	0	196	69	0	
	6 Elahkar	420		0	0	0	32	0	159	0	145	42	42	0	0	0	44	0	159	0	160	57	0	
	7 G. Kabeel	380		0	0	0	21	0	144	0	112	41	62	0	0	0	41	0	144	0	144	51	0	
	8 Kafia	3709		0	0	0	295	23	1392	0	1199	396	404	0	0	0	399	23	1392	0	1399	496	0	
	9 Elkarakwy	1811		0	0	0	162	18	677	0	581	206	167	0	0	0	194	18	677	0	681	241	0	
	10 Elgaradat	1307		0	0	0	108	28	483	0	382	152	154	0	0	0	138	28	483	0	486	172	0	
	11 Elnakhla	1191		0	0	0	82	273	347	0	270	94	125	0	0	0	273	347	0	0	349	124	0	
	12 Sahaly	1602		0	0	0	132	0	605	0	408	156	301	0	0	0	173	0	605	0	608	216	0	
	13 G.sahaly	1102		0	0	0	96	0	416	0	318	68	204	0	0	0	120	0	416	0	418	148	0	
	14 Khadra	240		0	0	0	21	0	91	0	61	32	35	0	0	0	26	0	91	0	91	32	0	
	15 Hamdy	305		0	0	0	21	0	115	0	82	21	66	0	0	0	33	0	115	0	116	41	0	
	16 Zawet Naem	1775		0	0	0	151	0	670	0	474	169	311	0	0	0	192	0	670	0	674	239	0	
	17 Berket Attas	2476		0	0	0	213	8	932	0	637	232	454	0	0	0	267	8	932	0	937	332	0	
	18 Gnady Kafazzazy	1566		0	0	0	120	183	522	0	425	152	164	0	0	0	150	183	522	0	525	186	0	
	19 Elhamamy	3811		0	0	0	151	1476	882	0	687	264	351	0	0	0	252	1476	882	0	887	314	0	
	20 Elsharkawa	1845		0	0	0	82	715	427	0	329	111	181	0	0	0	122	715	427	0	429	152	0	
	21 Eldekhla	4235		0	0	0	146	1640	980	0	685	249	535	0	0	0	281	1640	980	0	985	349	0	
	22 Elwzara	2140		0	0	0	98	829	495	0	408	97	213	0	0	0	141	829	495	0	498	177	0	
	23 Elkenawia	8606		0	0	0	622	42	3235	0	2781	855	1071	0	0	0	922	42	3235	0	3252	1155	0	
	24 Abou tahon	3105		0	0	0	272	0	1173	0	879	268	513	0	0	0	335	0	1173	0	1179	418	0	
	25 Elzeny	4189		0	0	0	352	0	1582	0	1291	332	632	0	0	0	452	0	1582	0	1591	564	0	
	26 Elkasida	490		0	0	0	31	0	185	0	152	44	78	0	0	0	53	0	185	0	186	66	0	
	27 Mahlit Keel	4159		0	0	0	249	0	1572	0	1178	465	695	0	0	0	449	0	1572	0	1578	560	0	
	28 Koom Elbous	2350		0	0	0	154	0	888	0	692	262	354	0	0	0	254	0	888	0	892	316	0	
	29 Sidi Azab	1690		0	0	0	151	0	638	0	582	138	181	0	0	0	182	0	638	0	642	228	0	

4.4.2 Calculation of Crop Water Requirements

When the input data have been entered and verified in Sheet 1, pressing **CTRL-h** (simultaneous keystrokes) will execute a macro that calculates daily average canal water requirements (m^3/day). The results will appear in the two right hand columns of Sheet 1, as illustrated in Figure 4-3. The first of these two columns (labeled *0-2 wks*) shows average crop water requirements for the current time period, the period during which the crop survey was conducted. The second column (labeled *2-4 wks*) presents forecast crop water requirements for the coming half-month period. These figures represent the daily average water requirement for those crops associated with each of the indicated canals over the half-month period.

Figure 4-3. Sheet 1

Keystroke (Ctrl-h)

Period 12		Current and Expected Cropping Pattern in Abou Houmos District												Water Requirements										
No.	Name	Total area	Current pattern						Expected pattern						(= m^3/day)									
			Barsed	Beans	Wheat	Veget	Garde	Cotton	Prep	Rice	Maize	Fallow	Barsed	Beans	Wheat	Veget	Garde	Cotton	Prep	Rice	Maize	Fallow	0 - 2 wks	2 - 4 wks
1	Elkamaheen	4861	0	0	0	505	0	1836	0	1546	554	420	0	0	0	525	0	1836	0	1846	654	0	141999	158794
2	Elzarka	3584	0	0	0	360	55	1333	0	1040	375	421	0	0	0	381	55	1333	0	1340	475	0	100474	116965
3	Etherfa	7959	0	0	0	753	0	3006	0	2522	672	1006	0	0	0	859	0	3006	0	3022	1072	0	226131	257772
4	Besntway	3295	0	0	0	240	100	1207	0	1013	330	405	0	0	0	345	100	1207	0	1213	430	0	91978	106120
5	Seaf Aldeen	515	0	0	0	55	0	195	0	166	52	47	0	0	0	55	0	195	0	196	69	0	15179	16751
6	Elahkar	420	0	0	0	32	0	159	0	145	42	42	0	0	0	44	0	159	0	160	57	0	12410	13611
7	G. Kabeel	380	0	0	0	21	0	144	0	112	41	62	0	0	0	41	0	144	0	144	51	0	10026	12521
8	Kafka	3709	0	0	0	295	23	1392	0	1199	396	404	0	0	0	399	23	1392	0	1399	496	0	107330	121289
9	Elkarawy	1811	0	0	0	162	18	677	0	581	206	167	0	0	0	194	18	677	0	681	241	0	52788	59011
10	Elgaradat	1307	0	0	0	108	28	483	0	382	152	154	0	0	0	138	28	483	0	486	172	0	36629	42749
11	Elnakhlia	1191	0	0	0	82	273	347	0	270	94	125	0	0	0	98	273	347	0	349	124	0	32670	37065
12	Sahaly	1602	0	0	0	132	0	605	0	408	156	301	0	0	0	173	0	605	0	608	216	0	41185	52650
13	G.sahaly	1102	0	0	0	96	0	416	0	318	68	204	0	0	0	120	0	416	0	418	148	0	29359	35599
14	Khadra	240	0	0	0	21	0	91	0	61	32	35	0	0	0	26	0	91	0	91	32	0	6353	7982
15	Hamdy	305	0	0	0	21	0	115	0	82	21	66	0	0	0	33	0	115	0	116	41	0	7776	9940
16	Zawet Naem	1775	0	0	0	151	0	670	0	474	169	311	0	0	0	192	0	670	0	674	239	0	46515	58172
17	Berket Altas	2476	0	0	0	213	8	932	0	637	232	454	0	0	0	267	8	932	0	937	332	0	64068	81190
18	Gnady Kafrazzazy	1566	0	0	0	120	183	522	0	425	152	164	0	0	0	150	183	522	0	525	186	0	44295	50070
19	Elihammy	3811	0	0	0	151	1476	882	0	687	264	351	0	0	0	252	1476	882	0	887	314	0	101312	113833
20	Eisharkawa	1845	0	0	0	82	715	427	0	329	111	181	0	0	0	122	715	427	0	429	152	0	48841	54949
21	Eidekhla	4235	0	0	0	146	1640	980	0	685	249	535	0	0	0	281	1640	980	0	985	349	0	107899	126493
22	Eiwzara	2140	0	0	0	98	829	495	0	408	97	213	0	0	0	141	829	495	0	498	177	0	57281	63296
23	Eikenawia	8606	0	0	0	622	42	3235	0	2781	855	1071	0	0	0	922	42	3235	0	3252	1155	0	244819	279348
24	Abou tahan	3105	0	0	0	272	0	1173	0	879	268	513	0	0	0	335	0	1173	0	1179	418	0	83341	101223
25	Eizzeny	4189	0	0	0	352	0	1582	0	1291	332	632	0	0	0	452	0	1582	0	1591	564	0	115913	136566
26	Elksasida	490	0	0	0	31	0	185	0	152	44	78	0	0	0	53	0	185	0	186	66	0	13513	15935
27	Mahlt Keel	4159	0	0	0	249	0	1572	0	1178	465	695	0	0	0	449	0	1572	0	1578	560	0	110570	136550
28	Koont Elious	2350	0	0	0	154	0	888	0	692	262	354	0	0	0	254	0	888	0	892	316	0	63959	77019
29	Sidi Azab	1690	0	0	0	151	0	638	0	582	138	181	0	0	0	182	0	638	0	642	228	0	49728	54435

4.4.3 Calculation of Canal Releases

Pressing **CTRL-c** will execute a second macro that computes the canal discharge rates needed to meet the calculated crop water requirements. The outputs of this calculation are presented in Sheet 4, as illustrated in Figure 4-4. These outputs include the following:

- a) Average crop water requirements (Column O): These outputs, which duplicate the last column of Sheet 1, are repeated in Sheet 4 for convenient viewing. They represent estimated average daily crop water requirements for the next time period following the current period. The calculated crop water requirements are for those irrigated areas directly served by each individual canal. They do not include water conveyed through to other canals.

- b) Combined flows in rotation (Columns Q – S): These are the actual canal discharge rates (m^3/dy) that will be required during each of the rotation intervals of the next half-month period. They include water to be delivered to irrigated areas on the given canal, as well as any additional water that will be conveyed through to other canals.
- c) District totals (Last row of the spread sheet following the list of all canals): Column O in this row shows the total of daily average crop water requirements for all irrigated areas served by the entire list of canals. Columns Q – S show total delivery rates required from the primary source for the entire district during each of the rotation intervals. (Note that the outputs in Columns Q through S are *not* simply the sums of the canal deliveries shown in the preceding rows since some of the preceding canal deliveries are duplicated when water is passed through one canal to another.)

Figure 4-4. Sheet 4

Analysis of operational releases (CTRL-C) (in rotations)

Number of rotations		3	Analysis of total canal flows in rotation: 2 week projection												
Number of days per rotation		5										Individual	Combined Flows (m^3/dy)		
Canal No	Name	Linkages					Rotation			flows (m^3/dy)	(in rotation)				
		1	2	3	4	5	1	2	3		1	2	3		
1	Elkamaheen	1	0	0	0	0	1	0	0	158794	476382	0	0		
2	Elzarka	2	0	0	0	0	0	0	1	116965	87816	0	669256		
3	Elherfa	3	0	0	0	0	1	0	0	257772	773316	0	0		
4	Besntway	2	4	0	0	0	0	0	1	106120	37564	0	318361		
5	Seaf Aldeen	2	5	0	0	0	1	0	0	16751	50252	0	0		
6	Elahkar	6	0	0	0	0	1	0	0	13611	40832	0	0		
7	G. Kabeel	2	4	7	0	0	1	0	0	12521	37564	0	0		
8	Kafka	8	0	0	0	0	0	1	0	121289	0	363866	0		
9	Elkarawy	9	0	0	0	0	0	0	1	59011	0	0	177034		
10	Elgaradat	10	0	0	0	0	0	0	1	42749	0	0	128248		
11	Elnakhlia	11	0	0	0	0	0	1	0	37065	0	111196	0		
12	Sahaly	12	0	0	0	0	0	1	0	52650	0	157949	0		
13	G.sahaly	13	0	0	0	0	1	0	0	35599	106797	0	0		
14	Khadra	14	0	0	0	0	1	0	0	7982	23946	0	0		
15	Hamdy	15	0	0	0	0	1	0	0	9940	29821	0	0		
16	Zawet Naem	16	0	0	0	0	1	0	0	58172	174516	0	0		
17	Berket Attas	17	0	0	0	0	0	1	0	81190	0	243569	0		
18	Gnady Kaffazzazy	18	0	0	0	0	0	1	0	50070	0	150211	0		
19	Elhamamy	19	0	0	0	0	0	1	0	113833	0	341499	0		
20	Elsharkawa	20	0	0	0	0	0	1	0	54949	0	164848	0		
21	Eldekhla	21	0	0	0	0	0	1	0	126493	0	379479	0		
22	Elwzara	22	0	0	0	0	0	0	1	63296	0	0	189887		
23	Elkenawia	23	0	0	0	0	0	0	1	0	0	0	838044		
24	Abou tahon	24	0	0	0	0	0	0	1	101223	0	0	303668		
25	Elzemy	25	0	0	0	0	1	0	0	135656	406969	0	0		
26	Elkasida	26	0	0	0	0	0	1	0	15935	0	47806	0		
27	Mahlt Keel	27	0	0	0	0	0	0	1	136550	0	0	409649		
28	Koom Elbous	28	0	0	0	0	0	1	0	77019	0	231058	0		
29	Sidi Azab	29	0	0	0	0	0	0	1	54435	0	0	163304		

4.4.4 Other Outputs

The user can view a one-year history of cropping and planting data for any single canal in Sheet 2. Type the canal number in cell B5 of Sheet 2 and execute the **CTRL-h** macro command¹. Sheet 2 displays a history of *Current* and *Expected* crop areas and the calculated

¹ If several canals are to be viewed the canal number can be changed and CTRL-h execution repeated as many times as desired. Repeating the program execution does not have any adverse effects on the analysis.

area planted in each time period for the most recent 24 time periods. The time period associated with each line of data is indicated in Column 2. The oldest data appear as the first row, and more recent data in succeeding rows. The most recent data appear in the last row of the sheet.

Figure 4-5 illustrates a one-year history display for canal 1. The most recent period of data is Period 6. Note that the first eighteen lines of data, which represent Periods 7 through 24, are from the preceding calendar year. The next 6 lines of data show periods 1 through 6 of the current year.

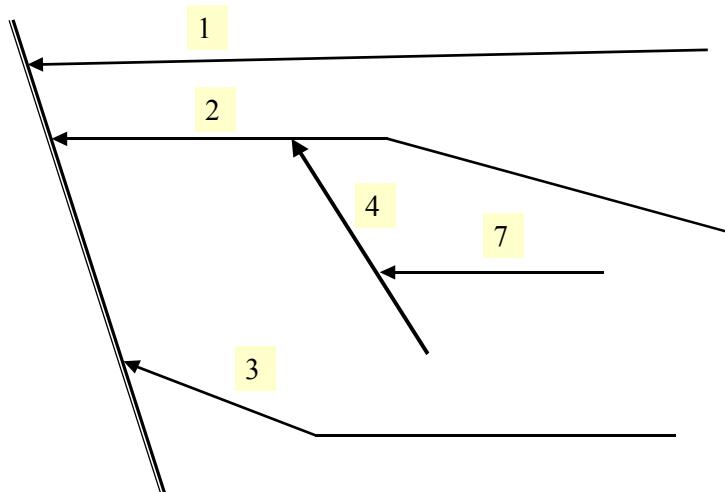
The user also has the option of viewing a one-year history of estimated daily average water requirements on Sheet 9 (illustrated in Figure 4-6). Sheet 9 presents a 24 period calendar-year history, with the most recent data appearing in the column corresponding to the most recent data period. Columns to the right of the current period number then represent data from the previous calendar year while columns to the left present current year data.

4.4.5 Setting up Canal Linkages and Rotation Information

The canal linkage information required by the model includes a numerical ‘virtual-map’ of the canal pathway by which water is delivered from the primary source to individual canals. All canals need to be assigned an identifying number during model setup. The numerical pathway indicates the sequence of canal numbers through which water will be delivered to a given canal. Such a map is indicated in Figure 4-7. In this example, the pathway to canal 1 is simply the number ‘1’. Likewise the pathway to canal 2 is just ‘2’. However canal 4 receives water through canal 2, so its pathway would be ‘2,4’. Similarly the pathway to canal 7 would be ‘2,4,7’.

Figure 4-7

Mapping of canals: an example



Note: Arrows are directed opposite to water flow while pathway numbers are sequenced in the direction of water flow.

Figure 4-5: Sample history spreadsheet (Sheet 2) for Canal 1

Figure 4-6: Summary of calculated crop water requirements (Sheet 9)

5 Crop Water Needs Microsoft Excel Model Administrator User's Manual

5.1 Introduction

The Model Administrator is assumed to be a person at the Ministry level with responsibility for insuring the integrity and correct use of the model. This implies responsibility for installing the model and configuring it for use in each district. The process of configuring the model will involve installing the Excel workbook on the District computer, assisting the District Engineer with setting up spreadsheet templates with the district name and appropriate crop and canal names in the several worksheets of the model, and determining the fixed input data to be loaded into Sheets 3 and 4. The entire Chapter 4 should be included together with this Chapter 5 to make a complete Model Administrator User's Manual.

5.2 Installing the Program

An original copy of the program is provided in the Excel file entitled *Canal Demand* on the floppy disks that accompany this report. The model is configured to operate from a directory on the C drive labeled *Canal*. Installing the program involves creating a directory with that name (*Canal*) on the district computer, then loading the program file (*Canal Demand*) into that directory.

The master copy of the program is comprised of spreadsheets built for the Abou Hummus District, along with three macros that run in the background of the spreadsheets. Canal names and crop names shown on all worksheets are for the Abou Hummus district. The fixed input data on Sheet 3 are also specifically for that district. Installing the model for another district therefore involves editing these spreadsheets to supply new crop and canal names and the additional fixed data for the new district. The various spreadsheets are protected and cannot be edited until the spreadsheet protection has been disabled.

Installing the program for another (different than Abou Hummus) district will therefore involve the following steps:

1. Create a program directory – Create a new directory entitled *Canal* on the C drive.
2. Import the program workbook – Copy the entire floppy disk (entitled *Canal Demand*) into the new directory. Files on this disk include the program itself and a set of files for the sample application of the model in the Abou Hummus district. The Abou Hummus sample files include a set of input data for 24 time periods and three history files.
3. Activate Excel and open the file entitled *Canal Demand* – After opening the workbook verify that Sheet 1 is displayed. If not, select the Sheet 1 tab at the bottom of the current spreadsheet.
4. Disable spreadsheet protection for Sheet 1 – To do this, select the tabs for *Tools*, *Protection* and *Unprotect Worksheet*. It is then possible to fill in the column and row headers (crop and canal names and canal numbers).
5. Establish a crop list – Select a list of up to nine primary crops for the district and enter the names of those crops as column headings. A tenth column is to be identified as *Fallow*. The list of crops should include those that cover the largest areas of land and therefore consume the greatest volume of water. Miscellaneous other crops that cover only small areas of land may be lumped together under the

generic heading of *Other*. The input spreadsheet (Sheet 1) should be set up from the outset to include all principal crops, not only those grown at the time the program is set up but also any others likely to be grown at any time during the entire year.

6. Replace the district name – The district name appearing at the top of Sheet 1 can be over-written.
7. Determine the number of canals – The various canals need to be arranged in the desired order, numbered accordingly and entered into the spreadsheet.
8. Set up fixed input data – The crop, weather and canal configuration data specific to the irrigation district and the list of crops, according to the positions shown in Figures 4-4 and 5-1. Details for determining these inputs are discussed further in sections 5.4 and 5.7.
9. Enter the canal linkage and rotation information – The logic of pathways was described earlier in Chapter 4. A more detailed discussion is presented in section 5.4.
10. Re-enable worksheet protection – Select tabs: *Tools*, *Protection*, and *Protect Worksheet*. Note that those cells that will be changed in the course of routine data entry and computation are not protected even when the rest of the worksheet is protected².
11. Copy the worksheet headings from Sheet 1 to other Sheets – Sheets 2, 4, 5, and 9 will need to be set up with the same canal names and crop headings. To do this, disable protection for each of those sheets, then copy and paste the column and row headings as appropriate. Then re-enable spreadsheet protection for each.

5.3 Initializing the History Files

In addition to the spreadsheets in the program workbook, the model also generates and continuously updates a set of exportable history files that can be imported to an Excel spreadsheet. These files are the *Current*, *Expected*, and *Planting* history files. They need to be created prior to the first running of the model, *i.e.*, when the CanalDemand workbook is opened for the first time for a new district. The initialization procedure is detailed in item 1 below. However the user should be warned that this procedure will setup entirely blank files by writing a zero in every data location. Since that will erase any pre-existing history data, two safeguards are included to prevent the inadvertent destruction of these files:

1. Initiation of the procedure cannot be done by keystroke. It requires the following sequence of steps:
 - a. With the workbook open, select *Tools*.
 - b. Select *Macro*.
 - c. Select *Macros* again.
 - d. Pick the macro name *InitializeHistoryFiles*.
 - e. Select *Run*.
2. Upon completion of a model run with new data, the history files will have been updated. It is recommended that they then be backed up by copying them to a separate directory.

² Enabling or disabling protection for individual cells within a worksheet is controlled by the cell format. Select the *Format*, *Cells*, and *Protection* tabs. Under the *Protection* tab is a check box entitled *Locked*. When that box is checked the individual cell will be protected whenever the sheet is protected. If the *Locked* check is removed the cell will not be protected even when the worksheet is.

Once the blank history files have been created it may be wise to begin the process of backfilling the history files with synthetic cropping pattern data for earlier periods. The synthetic data would serve to establish estimated planting dates for crops that were planted before the MALR cropping surveys were initiated. The reason would be to minimize errors in estimates of crop water requirements for the first few months after initiation of the model. Model estimates of crop water use depend upon the stage of growth of the various crops. Stage of growth in turn depends upon the dates when the crops were planted. When initializing a history file, all crop area data prior to the first data entry will be zero. The program will interpret the transition from zero feddan to non-zero crop areas (the first data entries) as the planting dates for all currently active crops. Consequently, initial estimates of crop water use for all currently irrigated crops would be low, reflecting the low rate of water use expected in the early stages of crop development. These initial estimates will be low even if the crops have actually reached full development. By estimating the planting dates for all active crops, then backfilling the history files to those dates using synthetic data the model will use the estimated planting dates as the start of the season. The synthetic data might simply be the first actual data set, but repeated for all periods back to the estimated time of planting.

5.4 Setting up the Fixed Input Data

Fixed input data are those that will be specific to the irrigation district, the region or the crop varieties, and will not change from one time period to another in the course of normal model operations. In general, they should only change when new circumstances arise, such as the introduction of a new dominant crop, or when improved data are available, such as new estimates of reference ET, better rainfall data, or better estimates of application or canal efficiencies. The fixed data include:

- Crop coefficients
- A table of ‘other water requirements’
- Historical ET_0 , the reference evapotranspiration
- Historical rainfall
- The length of time (number of days) in each time period
- Estimated application and canal efficiencies
- Canal linkages and rotations

Procedures for determining fixed input data are presented in section 5.7, *Estimating Fixed Input Data*.

The rules for establishing the pseudo map of canal linkages are explained with reference to Figure 4-7, which shows canals 1, 2 and 3 branching from a main canal, and canals 4 and 7 as tributary to canal 2. With regard to linkages between canals, this report uses the word ‘rank’ to describe where a canal fits in the hierarchy of canal linkages. It is assumed that there is a single primary source of water for the district. Generally this will be a single main canal. A Rank 1 canal receives water directly from that primary source. A Rank 2 canal is one that receives water from a Rank 1 canal, and does not connect directly to the primary source. A Rank 3 canal receives water from a Rank 2 canal, and so on. Some districts receive water from 2 or more main canals. In that case the model logic requires that those main canals be included in the analysis as Rank 1 canals, and all canals connecting directly to them are then Rank 2 canals. As presently configured, the model allows up to five ranks.

Fixed input data are stored in Sheets 3 and 4 (see Figures 5-1 and 4-4). The exact positioning of each of the data in these worksheets is critical, since the macros that depend on the data use row and column numbers to locate them. If the data are entered in a wrong location

model estimates will be incorrect, though such errors may not be apparent to the user. If for any reason the data need to be relocated in the worksheets the Visual Basic macros will need to be edited accordingly.

Because of the importance of preserving the integrity of these particular data, Sheet 3 is password protected. At the time of this program the password has been set as EPIQ. Sheet 4 is protected without a password because the district level user may need to consider changes in the schedule of rotations.

Additionally, it is recommended that a set of test data be set up for each location that can be run periodically to verify correct model operation. The correct values of model outputs can be verified once by hand for these test data, then the results can be used indefinitely to verify model performance.

5.5 Viewing the History Files

As noted earlier, the model provides for display of the three parameter histories for each canal designated by the user. The complete, off-line history files store these data for all canals on a continuing basis. They are Excel compatible, and can be viewed using the following procedure:

1. Open a new Excel worksheet in a new workbook.
2. Pick *File*.
3. Pick *Open*.
4. Go to the *C* drive, the *Canal* directory.
5. Under *Files of Type*: pick *All Files*.
6. Select the file of interest (*Current, Expected, or Planting*).
7. The *Text Import Wizard* will appear.
8. Pick *Delimited* data and go to *Next*.
9. Select the *Commas* delimiter type and go to *Next*.
10. Go to *Finish*.

The spreadsheet will then display the file. Note however, that these data are unlabeled. Data sets for the individual canals are separated by a line indicating the next canal number, but no crop headers, numbers of the time periods or canal names or numbers are shown. The user may choose to edit the newly created Excel files to add these labels.

5.6 Archiving the History Files

The history files record the data for one year, at the end of which time they begin to write over previous data. It is therefore suggested that the backup files be tagged and stored each year and new backup files created. The logical time to archive the history files will be at the end of the calendar year, that is, after data have been entered for period 24. At that point all data will be historical data for the current year. The *Expected* cropping pattern represents a forecast for the first period of the coming year, but it is only a forecast, and not historical in the same sense as the observed cropping areas represented by the *Current* and *Planting* data files.

Figure 5-1: Spreadsheet for fixed inputs (Sheet 3)

5.7 Estimating Fixed Input Data

Table A-1. FAO CLIMWAT weather data sites.

Country: EGYPT		Country Code: EGY		
No.	Station Name	Altitude	Latitude	Longitude
1	Alexandria	32 m	31.22 N.L.	29.57 E.L.
2	Aswan	200 m	24.02 N.L.	32.53 E.L.
3	Asyut	70 m	27.03 N.L.	31.01 E.L.
4	Bahariya	20 m	28.20 N.L.	28.54 E.L.
5	Baitim	2 m	31.33 N.L.	31.06 E.L.
6	Beni Suef	28 m	29.04 N.L.	31.06 E.L.
7	Bilbeis	20 m	30.24 N.L.	31.35 E.L.
8	Borg El Arab	20 m	30.54 N.L.	29.33 E.L.
9	Dabaa	18 m	30.56 N.L.	28.28 E.L.
10	Dakhla	111 m	25.29 N.L.	29.00 E.L.
11	Gemmeiza	20 m	30.43 N.L.	31.07 E.L.
12	Giza	19 m	30.03 N.L.	31.13 E.L.
13	Helwan	141 m	29.52 N.L.	31.20 E.L.
14	Ismailia	20 m	30.35 N.L.	31.26 E.L.
15	Kharga	73 m	25.27 N.L.	30.32 E.L.
16	Kom Ombo	102 m	24.29 N.L.	32.56 E.L.
17	Mallawi	20 m	27.42 N.L.	30.45 E.L.
18	Mansoura	30 m	31.03 N.L.	31.23 E.L.
19	Mersa Matruh	30 m	31.20 N.L.	27.13 E.L.
20	Minya	40 m	28.05 N.L.	30.44 E.L.
21	Port Said	6 m	31.17 N.L.	32.18 E.L.
22	Sakha	20 m	31.07 N.L.	30.57 E.L.
23	Salloum	6 m	31.32 N.L.	25.11 E.L.
24	Shandaweelel	60 m	26.26 N.L.	31.38 E.L.
25	Sidi Barrani	23 m	31.38 N.L.	25.58 E.L.
26	Siwa	-13 m	29.12 N.L.	25.29 E.L.
27	Sohag	61 m	26.34 N.L.	31.42 E.L.
28	Tahrir	20 m	30.39 N.L.	30.42 E.L.

6 Crop Water Needs Microsoft Excel District Calculation Results

6.1 Introduction

During the period June – August 2001, Dr. Marshall English, an expatriate irrigation-scheduling specialist on TDY assignment with EPIQ, developed a Microsoft Excel spreadsheet (also called an operational tool herein) for use in the irrigation district office. This spreadsheet uses the cropping pattern information transferred from MALR to calculate the real-time crop water needs for both the “current” and “expected” half-month time periods. Details of the spreadsheet development are given in APRP Water Policy Program Report No. 45, (December 2001), Appendix C, which is the TDY report of Dr. English.

Another spreadsheet and associated suite of graphs was developed for analyzing results of the operational tool that calculates water needs. See section 6.4 for detailed description, explanation, and presentation of results of this spreadsheet. This chapter gives results of use of these tools in the Beba Irrigation District. It incorporates a comparison of crop water needs and water delivered on a district-wide basis. The water delivered to the district was obtained from the water-monitoring program conducted in the Beba Irrigation District.

For the Beba Irrigation District as one of the five pilot districts of the MISD benchmark, calculations were made for the whole period of cropping pattern and water delivery information collected during the benchmark activities, from March 1, 2000 through September 30, 2001.

6.2 Crop K_c Values

Use of the operational tool for an irrigation district in Egypt requires setup procedures including determination of proper crop coefficients (K_c values) for the crops grown in the district. Table 6-1 gives crop coefficients developed for the major crops grown in Egypt consistent with the MISD cropping pattern information collection program. The FAO parameters ($K_{c\text{-ini}}$, $K_{c\text{-mid}}$, $K_{c\text{-end}}$, L_{ini} , L_{dev} , L_{mid} , and L_{late}) taken from FAO 56 were used in a Microsoft Excel spreadsheet to calculate the crop coefficients. As new districts are added to the program, these coefficients should be carefully reviewed to ensure that the values are appropriate especially for the mix of crops reported in the *Other* category, *i.e.*, other than major crops and for any crops added as major crops that are not listed in Table 6-1.

6.3 Minimum Irrigation Depth

Depending primarily on the method of irrigation used for the land within the district and possibly the crop, there is a certain minimum depth of water that can be applied during an irrigation. For instance, a farmer must have enough water to spread over the whole basin for the level-basin application method of irrigation. The calculation scheme of the operational tool developed by Dr. Marshall English and detailed in Appendix C (Report 45) was modified to allow incorporation of this concept of minimum irrigation depth. Table 6-2 shows the modified macro statement used for the results of this report. Values of minimum irrigation depth are input into the operational tool on Sheet 3, Cells A32 through I32, for each crop.

Table 6-1. Crop coefficients (K_c values) for use in Egypt in the crop water needs calculation spreadsheet (operational tool) using the MISD cropping pattern information.

Period	Maize	Bersseem (long)	Bersseem (short)	Beans	Wheat	¹ Vegetables	² Garden	Cotton	Rice	Short Dur	Sugar Cane	Sesame	Sunflower	³ Other
1	0.29	0.21	0.21	0.27	0.37	0.82	0.90	0.27	0.56	0.56	0.60	0.21	0.21	0.79
2	0.56	0.45	0.45	0.50	0.70	0.82	0.90	0.50	1.05	1.05	0.60	0.41	0.41	0.79
3	0.79	0.72	0.72	0.50	0.79	0.82	0.90	0.53	1.06	1.09	0.64	0.66	0.73	0.79
4	1.10	0.90	0.90	0.50	0.91	0.82	0.90	0.72	1.13	1.17	0.75	1.00	1.11	0.79
5	1.20	0.90	0.90	0.51	1.04	0.82	0.90	0.93	1.19	1.20	0.86	1.10	1.15	0.79
6	1.20	0.90	0.72	0.70	1.14	0.82	0.90	1.14	1.20	1.20	0.99	1.10	1.05	0.79
7	1.13	0.90		0.98	1.15	0.82	0.90	1.20	1.20	1.20	1.11	1.00	0.46	0.79
8	0.75	0.90		1.15	1.15	0.82	0.90	1.20	1.20	1.11	1.23	0.39		0.79
9	0.07	0.90		1.15	1.15	0.82	0.90	1.20	1.18	0.44	1.25			0.79
10		0.90		0.89	1.14	0.82	0.90	1.18	1.04		1.25			0.79
11		0.90		0.20	0.88	0.82	0.90	1.05	0.43		1.25			0.79
12		0.90		0.43	0.43	0.82	0.90	0.92			1.25			0.79
13		0.90				0.82	0.90	0.54			1.25			0.79
14		0.12				0.82	0.90				1.25			0.79
15						0.82	0.90				1.25			0.79
16						0.82	0.90				1.25			0.79
17						0.82	0.90				1.25			0.79
18						0.82	0.90				1.25			0.79
19						0.82	0.90				1.25			0.79
20						0.82	0.90				1.25			0.79
21						0.82	0.90				1.17			0.79
22						0.82	0.90				1.01			0.79
23						0.82	0.90				0.85			0.79
24						0.82	0.90				0.68			0.79

¹Because some districts report vegetables all year, this column uses the seasonal average of 26 vegetable crops of FAO 56

²As used by Marshall English

³Estimated (to cover all 24 periods) as approximate average of crops in this table other than sugar cane, rice, and vegetables

Table 6-2. The modified macro statement used for the results of this chapter.

```

Sub RecordHist()
'
' RecordHist Macro
'
' Macro recorded 7/13/2001 by Marshall English and modified by Larry King 10/8/2001
'
' Keyboard Shortcut: Ctrl+h
'
'This routine inputs a cropping pattern worksheet (sheet 1)and uses it for the following:
' (a) updates the history files for current (weeks 0-2) and forecast (weeks 2-4) cropping patterns, planting
' history for the current period (assumed to be planted during weeks 0 - 2)
' (b) calculates weighted averages of crop coefficients for each crop on each canal, for the current (weeks 0-2)
' and forecast (weeks 2-4) periods
' (c) calculates weighted average water duty, by canal, for each crop
' (d) calculates total water delivery required for each canal for the near-term (weeks 0-2) and longer term
' (weeks 2-4)
' (e) displays current and expected cropping patterns and current planting schedule for all crops for any chosen
' canal for the current period (period for which computation is in progress (sheet 2)
' (f) displays wheighted average crop coefficients and water duties for all crops on all canals for the current and
' expected cropping patterns (sheet 5)
'
'#####
'#####      Update external files of current and expected crop areas and current and expected planting   #####
'

Dim current(24, 13, 60), expected(24, 13, 60), planting(24, 13, 60), Kc(0 To 23, 9), KcAvg(60, 9), ExpPlant(24,
13, 60), Flag(9), OCwr(0 To 23, 9), SumOCwr(60, 9)
NCanals = Worksheets("Sheet3").Cells(33, 12)
Open "c:\canal\current" For Input As #1
Open "c:\canal\expected" For Input As #2
For cl = 1 To NCanals
    Line Input #1, canal
For p = 1 To 24
    Input #1, current(p, 4, cl), current(p, 5, cl), current(p, 6, cl), current(p, 7, cl), current(p, 8, cl), current(p, 9, cl),
    current(p, 10, cl), current(p, 11, cl), current(p, 12, cl), current(p, 13, cl)
Next p
Next cl
For cl = 1 To NCanals
    Line Input #2, canal
For p = 1 To 24
    Input #2, expected(p, 4, cl), expected(p, 5, cl), expected(p, 6, cl), expected(p, 7, cl), expected(p, 8, cl),
    expected(p, 9, cl), expected(p, 10, cl), expected(p, 11, cl), expected(p, 12, cl), expected(p, 13, cl)

Next p
Next cl
Close #1
Close #2
'
' load new data and store in current and expected history arrays
'

Set Period = Worksheets("sheet1").Cells(2, 3)
For Ncan = 1 To NCanals
    For Ncrop = 4 To 13
        Set current(Period, Ncrop, Ncan) = Worksheets("sheet1").Cells(Ncan + 4, Ncrop)
        Set expected(Period, Ncrop, Ncan) = Worksheets("sheet1").Cells(Ncan + 4, Ncrop + 10)
    Next Ncrop
    Next Ncan
'

```

Table 6-2. (Continued)

```

' compute areas planted in this interval or expected planting for next, and store in planting history files
'
Open "c:\canal\planting" For Output As #3
For cl = 1 To NCanals
For cr = 1 To 13
For p = 1 To 24
If p = 1 Then
    planting(1, cr, cl) = current(p, cr, cl) - current(24, cr, cl)
Else
    planting(p, cr, cl) = current(p, cr, cl) - current(p - 1, cr, cl)
End If
If planting(p, cr, cl) < 0 Then planting(p, cr, cl) = 0

ExpPlant(p, cr, cl) = expected(p, cr, cl) - current(p, cr, cl)
If ExpPlant(p, cr, cl) < 0 Then ExpPlant(p, cr, cl) = 0

Next p
Next cr
Next cl
For cl = 1 To NCanals
    Write #3, "Canal Number", cl
For p = 1 To 24
    Write #3, planting(p, 4, cl), planting(p, 5, cl), planting(p, 6, cl), planting(p, 7, cl), planting(p, 8, cl),
planting(p, 9, cl), planting(p, 10, cl), planting(p, 11, cl), planting(p, 12, cl), planting(p, 13, cl)
    Next p
    Next cl
    Close #3
'
'Re-write current and expected history files
'
Open "c:\canal\current" For Output As #1
For cl = 1 To NCanals
    Write #1, "Canal Number", cl
For p = 1 To 24
    Write #1, current(p, 4, cl), current(p, 5, cl), current(p, 6, cl), current(p, 7, cl), current(p, 8, cl), current(p, 9, cl),
current(p, 10, cl), current(p, 11, cl), current(p, 12, cl), current(p, 13, cl)
Next p
Next cl
Open "c:\canal\expected" For Output As #2
For cl = 1 To NCanals
    Write #2, "Canal Number", cl
For p = 1 To 24
    Write #2, expected(p, 4, cl), expected(p, 5, cl), expected(p, 6, cl), expected(p, 7, cl), expected(p, 8, cl),
expected(p, 9, cl), expected(p, 10, cl), expected(p, 11, cl), expected(p, 12, cl), expected(p, 13, cl)
Next p
Next cl

Close #1
Close #2
'
' ##### Display history files for designated canal #####
'
Set canal = Worksheets("sheet2").Cells(5, 2)
Worksheets("sheet2").Cells(5, 2).Value = canal
Worksheets("sheet2").Cells(2, 15).Value = Period
For p = 1 To 24
    DataRow = Period - p + 1
    If Period - p < 0 Then

```

Table 6-2. (Continued)

```

        DataRow = Period + 24 - p + 1
    End If
For K = 3 To 12
    Worksheets("sheet2").Cells(25 - p + 7, 2).Value = DataRow
    Worksheets("sheet2").Cells(25 - p + 7, K).Value = current(DataRow, K + 1, canal)
    Worksheets("sheet2").Cells(25 - p + 7, K + 12).Value = planting(DataRow, K + 1, canal)
    Worksheets("sheet2").Cells(25 - p + 7, K + 23).Value = expected(DataRow, K + 1, canal)
Next K
Next p
'
' ##### Calculate weighted averages of Kc, and volumes of other crop water needs #####
' ##### for each crop in each canal #####
'

' Notes:
'   If Forecast = 0 the forecast is for the next 15 days
'   If Forecast = 1 the forecast is for the period 15 to 30 days in the future
'   If Flag = 99 then the crop is a perennial, and KcAvg will be set to Kc(period), i.e.
'       the crop coefficient will be independent of planting date, and will only
'       depend on time of year
'

For Forecast = 0 To 1
    Set Period = Worksheets("sheet1").Cells(2, 3)
    T = Period
'
    Read in values of Kc, Flag and OCwr from W/S #3 for all crops over all tau #####
'

For tau = 0 To 23
For cr = 1 To 9
    Set Flag(cr) = Worksheets("sheet3").Cells(6, cr)
    Set Kc(tau, cr) = Worksheets("sheet3").Cells(8 + tau, cr)
    Set OCwr(tau, cr) = Worksheets("sheet3").Cells(8 + tau, cr + 14)
Next cr
Next tau
'

For cl = 1 To NCanals
For cr = 1 To 9
    SumA = 0
    SumAK = 0
    SumOCwr(cl, cr) = 0

If Forecast = 1 Then
    SumA = ExpPlant(Period, cr + 3, cl)
    SumAK = ExpPlant(Period, cr + 3, cl) * Kc(0, cr)
    SumOCwr(cl, cr) = OCwr(0, cr) * ExpPlant(Period, cr + 3, cl)
End If
'
    Aggregate areas planted, Kc times area, and OCwr over all intervals where planting occurred

For tau = 0 To 12 - Forecast
    If T - tau < 1 Then
        Offset = 24
    Else
        Offset = 0
    End If

    SumA = SumA + planting(T - tau + Offset, cr + 3, cl)

```

Table 6-2. (Continued)

```

SumAK = SumAK + planting(T - tau + Offset, cr + 3, cl) * Kc(tau + Forecast, cr)
SumOCwr(cl, cr) = SumOCwr(cl, cr) + OCwr(tau + Forecast, cr) * planting(T - tau + Offset, cr + 3, cl)

```

Next tau

' for perennial crops set KcAvg to constant value

```

If Flag(cr) = 99 Then
    KcAvg(cl, cr) = Kc(Period - 1, cr)
Else
'
```

```

If SumA <= 0 Then
    KcAvg(cl, cr) = 0
Else
    KcAvg(cl, cr) = SumAK / SumA
End If
End If
If Forecast = 0 Then
    Worksheets("sheet5").Cells(cl + 5, cr + 3).Value = KcAvg(cl, cr)
Else
    Worksheets("sheet5").Cells(cl + NCanals + 8, cr + 3).Value = KcAvg(cl, cr)
End If

```

Next cr

Next cl

```
#####
##### Compute water duties by canal and crop for given period #####
#####
```

```

If Period = 24 Then
    If Forecast = 1 Then
        Set ET0 = Worksheets("sheet3").Cells(8, 11)
        Set Rain = Worksheets("sheet3").Cells(8, 12)
        Set Plength = Worksheets("sheet3").Cells(8, 26)
        Set Eff = Worksheets("sheet3").Cells(35, 5)
    Else
        Set ET0 = Worksheets("sheet3").Cells(Period + 7 + Forecast, 11)
        Set Rain = Worksheets("sheet3").Cells(Period + 7 + Forecast, 12)
        Set Plength = Worksheets("sheet3").Cells(Period + 7, 26)
        Set Eff = Worksheets("sheet3").Cells(35, 5)
    End If
Else
    Set ET0 = Worksheets("sheet3").Cells(Period + 7 + Forecast, 11)
    Set Rain = Worksheets("sheet3").Cells(Period + 7 + Forecast, 12)
    Set Plength = Worksheets("sheet3").Cells(Period + 7, 26)
    Set Eff = Worksheets("sheet3").Cells(35, 5)
End If

```

```

For cl = 1 To NCanals
    SumW = 0
For cr = 1 To 9
    If Forecast = 0 Then
        AreaF = current(Period, cr + 3, cl)
    Else
        AreaF = expected(Period, cr + 3, cl)
    End If

```

If KcAvg(cl, cr) <= 0 Then

Table 6-2. (Continued)

```

If AreaF = 0 Then
    duty = 0
Else
    duty = 0 + SumOCwr(cl, cr) / (Plength * AreaF)
    MinID = Worksheets("sheet3").Cells(32, cr)
    ThDuty = MinID / Plength
    If duty < ThDuty Then
        duty = ThDuty
    End If
End If
Else
    If AreaF = 0 Then
        duty = 0
    Else
        duty = (KcAvg(cl, cr) * ET0 - (Rain / Plength)) / Eff + SumOCwr(cl, cr) / (Plength * AreaF)
        MinID = Worksheets("sheet3").Cells(32, cr)
        ThDuty = MinID / Plength
        If duty < ThDuty Then
            duty = ThDuty
        End If
    End If
End If
End If
If duty < 0 Then
    duty = 0
End If
If Forecast = 0 Then
    Worksheets("sheet5").Cells(cl + 5, cr + 12).Value = duty
Else
    Worksheets("sheet5").Cells(cl + NCanals + 8, cr + 12).Value = duty
End If
'
' ##### Compute total daily required water volumes, by canal #####
'
If Forecast = 0 Then
    AreaF = current(Period, cr + 3, cl)
    SumW = SumW + duty * AreaF
Else
    AreaF = expected(Period, cr + 3, cl)
    SumW = SumW + duty * AreaF
End If
Next cr
TotW = SumW * 4.2
Worksheets("sheet1").Cells(4 + cl, 24 + Forecast).Value = TotW
If Period + 2 + Forecast <= 24 Then
    Worksheets("sheet9").Cells(4 + cl, Period + 2 + Forecast).Value = TotW
Else
    Worksheets("sheet9").Cells(4 + cl, 3).Value = TotW
End If
Next cl
Next Forecast
Worksheets("sheet5").Cells(2, 3).Value = Period
'
End Sub

```

6.4 Pilot District Results

This section presents the results of calculations without detailed discussion or interpretation (see Report 45 for discussion and interpretation of these results). The focus of this chapter is on how to use the tools to perform the calculations and prepare the graphs. Note that for the Beba district, Table 3-1 shows eight canals to which the MALR cropping pattern information is associated. MISD data collection and processing began on March 1, 2000, using these 8 canals covering the total command area for the district. Table 6-3 shows the input data of Sheet 3 of the operational tool for the Beba district.

Table 6-4 shows calculations of Sheet 1 copied from Canal Demand, the crop water needs calculation spreadsheet, for the Beba Irrigation District for each half-month period from March 1, 2000 through September 30, 2001. The cropping pattern data of Chapter 3 were used as input to Canal Demand for these calculations. A problem with the cropping pattern data was observed. Some of these calculations used raw cropping pattern data that had not been processed by the MALR Microsoft Access database. These raw data sometimes had errors indicated by reported crop areas not summing to total areas for the particular branch canal. This data problem was handled by adding check sums to Sheet 1 to help find and correct these data errors. The last two columns of Table 6-4 are check sums for each canal for the existing and expected cropping patterns, respectively. Each check sum value in these last two columns should equal the command area of the canal. If not, the data error must be found in the row and corrected. The first row of check sums below the last canal total the values in the respective columns. The two check sums in the bottom row sum over all crops of the existing and expected crop patterns, respectively, and of course, must equal the total district command area. These check sums have proven to be a valuable aid to ensuring correct data entry to the Canal Demand spreadsheet, but will be unnecessary when all cropping pattern data are processed by the MALR Access database.

Table 6-5 (Sheet 1 of Beba DEMO) shows a comparison of calculated crop water needs and water delivered to the Beba pilot district expressed as daily average over each half-month period from March 2000 through September 2001. Note that for any particular half month, the existing area of crop may differ from the expected area. Thus, two values of water delivered per feddan of cropped area are calculated. For each half-month period, four pieces of data available from results of Canal Demand must be entered into Beba DEMO Sheet 1, shown here as Table 6-5. These four district-wide data values are: (1) crop water needs (million m³/day) for existing crops, (2) crop water needs (million m³/day) for expected crops, (3) existing area (feddans) of fallow, and (4) expected area (feddans) of fallow. In transposing these four data values from results of Canal Demand calculations (Table 6-4) to Beba DEMO (Table 6-5) one must be very careful to enter the data into the correct cell of the spreadsheet. Note that for each period, the district-wide existing crop water requirement (m³/day) is given as the sum of the column labeled “0 – 2 wks” in Table 6-4. This value (626398 m³/day, for period 5, 2000, in Table 6-4) is entered into Table 6-5 as the water required for existing crops for the same time period (period 5, 1 Mar – 15 Mar, 2000, as 0.6264 million m³/day). In contrast, the district-wide expected crop water requirement (sum of column labeled “2 – 4 wks” in Table 6-4) must be entered into Table 6-5 for the next period. For example, the “2 – 4 wks” water requirement in Table 6-4, period 5 (699477 m³/day), is entered into Table 6-5 as 0.6995 million m³/day for 16 Mar – 31 Mar. In other words, the governing time in Table 6-5 is listed in the columns labeled “Dates (To, From), Yr”.

Table 6-3. Sheet 3 copied from Canal Demand, the crop water needs calculation spreadsheet, showing input data for the Beba District.

Crop Coefficients										Weather (mm/mo)	Time (T)	Lag time (tau)	Other crop water requirements (mm per period)						Period Lengths
Percn. Percn.													Barseer Beans	Wheat	Vegs	Garden	Cotton	Other	
		99	99	Beans	Wheat	Vegs	Garden	Cotton	Other	Rice	Maize								
0.21	0.27	0.37	0.82	0.90	0.27	0.79	0.56	0.29	1.90	0.00	1	0	0	0	0	50	0	75	
0.45	0.50	0.70	0.82	0.90	0.50	0.79	1.05	0.56	2.10	0.00	2	1	0	0	0	0	0	16	
0.72	0.50	0.79	0.82	0.90	0.53	0.79	1.09	0.79	2.60	1.00	3	2	0	0	0	0	0	15	
0.90	0.50	0.91	0.82	0.90	0.72	0.79	1.17	1.10	3.00	1.00	4	3	0	0	0	0	0	14	
0.90	0.51	1.04	0.82	0.90	0.93	0.79	1.20	1.20	3.50	0.50	5	4	0	0	0	0	0	15	
0.90	0.70	1.14	0.82	0.90	1.14	0.79	1.20	1.20	3.90	0.50	6	5	0	0	0	0	0	16	
0.90	0.98	1.15	0.82	0.90	1.20	0.79	1.20	1.13	5.30	0.50	7	6	0	0	0	0	0	15	
0.90	1.15	1.15	0.82	0.90	1.20	0.79	1.11	0.75	5.70	0.50	8	7	0	0	0	0	0	15	
0.90	1.15	1.15	0.82	0.90	1.20	0.79	1.20	0.44	6.00	0.00	9	8	0	0	0	0	0	15	
0.90	0.89	1.14	0.82	0.90	1.18	0.79	0.00	0.00	6.20	0.00	10	9	0	0	0	0	0	16	
0.90	0.20	0.88	0.82	0.90	1.05	0.79	0.00	0.00	6.80	0.00	11	10	0	0	0	0	0	15	
0.90	0.00	0.43	0.82	0.90	0.92	0.79	0.00	0.00	7.00	0.00	12	11	0	0	0	0	0	15	
0.90	0.00	0.00	0.82	0.90	0.54	0.79	0.00	0.00	6.70	0.00	13	12	0	0	0	0	0	15	
0.12	0.00	0.00	0.82	0.90	0.00	0.79	0.00	0.00	6.30	0.00	14	13	0	0	0	0	0	16	
0.00	0.80	0.00	0.82	0.90	0.00	0.79	0.00	0.00	6.20	0.00	15	14	0	0	0	0	0	15	
0.00	0.00	0.00	0.82	0.90	0.00	0.79	0.00	0.00	6.00	0.00	16	15	0	0	0	0	0	16	
0.00	0.00	0.00	0.82	0.90	0.00	0.79	0.00	0.00	6.70	0.00	17	16	0	0	0	0	0	15	
0.00	0.00	0.00	0.82	0.90	0.00	0.79	0.00	0.00	5.70	0.00	18	17	0	0	0	0	0	15	
0.00	0.00	0.00	0.82	0.90	0.00	0.79	0.00	0.00	5.00	0.00	19	18	0	0	0	0	0	15	
0.00	0.00	0.00	0.82	0.90	0.00	0.79	0.00	0.00	4.20	0.00	20	19	0	0	0	0	0	16	
0.00	0.00	0.00	0.82	0.90	0.00	0.79	0.00	0.00	5.90	0.00	17	16	0	0	0	0	0	15	
0.00	0.00	0.00	0.82	0.90	0.00	0.79	0.00	0.00	3.30	0.00	21	20	0	0	0	0	0	15	
0.00	0.00	0.00	0.82	0.90	0.00	0.79	0.00	0.00	2.50	0.00	22	21	0	0	0	0	0	15	
0.00	0.00	0.00	0.82	0.90	0.00	0.79	0.00	0.00	2.30	2.00	23	22	0	0	0	0	0	15	
0.00	0.00	0.00	0.82	0.90	0.00	0.79	0.00	0.00	2.10	2.00	24	23	0	0	0	0	0	16	
50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	
									Number of canals 8.00									50 : Minimum Irrigation Depth (mm)	
									Efficiency Appl. Canal Total 0.75 0.933 0.70										

Table 6-4. Sheet 1 copied from Canal Demand, the crop water needs calculation spreadsheet, for Beba Irrigation District for half-month time periods, March 1 – 15 through September 15 – 30, 2001 (See file “Crops & Needs – Beba” on disk).

Current and Expected Cropping Pattern in Beba Irrigation District (2000)											
Period	5	Area (Fed.)									
Canal No/Name	Total	Barsed	B	Wheat	Vege	Gard	Cotton	Others	Ri	Maize	Fallow
1 G. Ammar	8273	2480	0	3365	0	99	650	1128	0	551	2480
2 Ammar Elkebia	5161	1610	0	2271	0	12	600	201	0	467	1610
3 Ahmad Basha N.	4543	1905	0	1524	0	374	200	169	0	371	1905
4 Ahmad Basha S.	6349	2704	0	1872	0	185	100	1259	0	229	2704
5 Eisharanna N.	4293	2307	0	1409	0	176	0	396	0	5	2307
6 Eisharanna S.	911	413	0	283	0	142	0	73	0	0	413
7 Pumps	2468	717	0	674	0	918	0	159	0	0	717
8 Abou Romh	268	165	0	67	0	0	36	0	0	165	0
Check Sums:	32266	12301	0	11465	0	1906	1550	3421	0	1623	12301
											0
											11465
											2282
											3417
											0
											895
											626398
											69477
											32266
											32266
											32266
											32266

Current and Expected Cropping Pattern in Beba Irrigation District (2000)											
Period	6	Area (Fed.)									
Canal No/Name	Total	Barsed	B	Wheat	Vege	Gard	Cotton	Others	Ri	Maize	Fallow
1 G. Ammar	8273	2480	0	3365	0	99	650	1128	0	551	2480
2 Ammar Elkebia	5161	1610	0	2271	0	12	600	201	0	467	1610
3 Ahmad Basha N.	4543	1905	0	1524	0	374	200	169	0	371	1905
4 Ahmad Basha S.	6349	2704	0	1872	0	185	100	1259	0	229	2704
5 Eisharanna N.	4293	2307	0	1409	0	176	0	396	0	5	2307
6 Eisharanna S.	911	413	0	283	0	142	0	73	0	0	413
7 Pumps	2468	717	0	674	0	918	0	159	0	0	717
8 Abou Romh	268	165	0	67	0	0	36	0	0	165	0
Check Sums:	32266	12301	0	11465	0	1906	1550	3421	0	1623	12301
											0
											11465
											2282
											3417
											0
											895
											626398
											69477
											32266
											32266
											32266
											32266

Current and Expected Cropping Pattern in Beba Irrigation District (2000)											
Period	7	Area (Fed.)									
Canal No/Name	Total	Barsed	B	Wheat	Vege	Gard	Cotton	Others	Ri	Maize	Fallow
1 G. Ammar	8273	2480	0	3365	0	99	1150	1128	0	51	2480
2 Ammar Elkebia	5161	1610	0	2271	0	12	1171	97	0	0	1610
3 Ahmad Basha N.	4543	1905	0	1524	0	374	494	169	0	0	1905
4 Ahmad Basha S.	6349	2704	0	1872	0	185	333	1255	0	0	2704
5 Eisharanna N.	4293	2307	0	1409	0	176	0	396	0	5	2307
6 Eisharanna S.	911	413	0	283	0	142	0	73	0	0	413
7 Pumps	2468	717	0	674	0	918	0	159	0	0	717
8 Abou Romh	268	165	0	67	0	0	36	0	0	165	0
Check Sums:	32266	12301	0	11465	0	1906	1550	3421	0	1623	12301
											0
											11465
											2282
											3417
											0
											895
											626398
											69477
											32266
											32266
											32266

Table 6-4. (Continued).

Current and Expected Cropping Pattern in Beba Irrigation District (2000)											
Period 8		Area (Fed.)									
Canal No Name		Total	Barsed	Bd	Wheat	Barseet	Veget	Gard	Cotton	Others	Ri Maize
1 G. Ammar	8273	2480	0	3365	0	99	1150	1128	0	0	51
2 Ammar Elkebia	5161	1610	0	2271	0	12	1171	97	0	0	1610
3 Ahmad Bastha N.	4543	1905	0	1524	0	374	484	169	0	0	77
4 Ahmad Bastha S.	6349	2704	0	1872	0	185	333	1255	0	0	2704
5 Elsharaha N.	4293	2307	0	1409	0	176	4	396	0	1	2307
6 Elsharaha S.	911	413	0	283	0	142	0	73	0	0	413
7 Pumps	2468	717	0	674	0	918	0	159	0	0	717
8 Abou Romh	268	165	0	67	0	0	0	36	0	0	165
Check Sums:	32266	12301	0	11465	0	1906	3152	3313	0	0	129
						32266	12301	0	0	0	32266

Current and Expected Cropping Pattern in Beba Irrigation District (2000)											
Period 8		Area (Fed.)									
Canal No Name		Total	Barsed	Bd	Wheat	Barseet	Veget	Gard	Cotton	Others	Ri Maize
1 G. Ammar	8273	2480	0	3365	0	99	1150	1128	0	0	51
2 Ammar Elkebia	5161	1610	0	2271	0	12	1171	97	0	0	1610
3 Ahmad Bastha N.	4543	1905	0	1524	0	374	484	169	0	0	77
4 Ahmad Bastha S.	6349	2704	0	1872	0	185	333	1255	0	0	2704
5 Elsharaha N.	4293	2307	0	1409	0	176	4	396	0	1	2307
6 Elsharaha S.	911	413	0	283	0	142	0	73	0	0	413
7 Pumps	2468	717	0	674	0	918	0	159	0	0	717
8 Abou Romh	268	165	0	67	0	0	0	36	0	0	165
Check Sums:	32266	12301	0	11465	0	1906	3152	3313	0	0	32266
						32266	12301	0	0	0	32266

Current and Expected Cropping Pattern in Beba Irrigation District (2000)											
Period 9		Area (Fed.)									
Canal No Name		Total	Barsed	Bd	Wheat	Barseet	Veget	Gard	Cotton	Others	Ri Maize
1 G. Ammar	8273	2108	0	0	99	1150	1500	0	0	3416	1165
2 Ammar Elkebia	5161	1400	0	0	12	1171	411	0	0	2167	1420
3 Ahmad Bastha N.	4543	1820	0	0	0	374	494	234	0	0	1621
4 Ahmad Bastha S.	6349	2650	0	0	185	333	1313	0	0	1868	2300
5 Elsharaha N.	4293	2330	0	0	176	4	373	0	0	1410	2350
6 Elsharaha S.	911	350	0	0	142	0	136	0	0	283	300
7 Pumps	2468	580	0	0	918	0	277	0	0	693	510
8 Abou Romh	268	120	0	0	0	81	0	0	0	67	150
Check Sums:	32266	11358	0	0	1906	3152	4325	0	0	11525	9695
						32266	11358	0	0	1906	3152

Current and Expected Cropping Pattern in Beba Irrigation District (2000)											
Period 8		Area (Fed.)									
Canal No Name		Total	Barsed	Bd	Wheat	Barseet	Veget	Gard	Cotton	Others	Ri Maize
1 G. Ammar	8273	2480	0	3365	0	99	1150	1128	0	0	51
2 Ammar Elkebia	5161	1610	0	2271	0	12	1171	97	0	0	1610
3 Ahmad Bastha N.	4543	1905	0	1524	0	374	494	169	0	0	77
4 Ahmad Bastha S.	6349	2704	0	1872	0	185	333	1255	0	0	2704
5 Elsharaha N.	4293	2307	0	1409	0	176	4	396	0	1	2307
6 Elsharaha S.	911	413	0	283	0	142	0	73	0	0	413
7 Pumps	2468	717	0	674	0	918	0	159	0	0	717
8 Abou Romh	268	165	0	67	0	0	0	36	0	0	165
Check Sums:	32266	12301	0	11465	0	1906	3152	3313	0	0	32266
						32266	12301	0	0	0	32266

Current and Expected Cropping Pattern in Beba Irrigation District (2000)											
Period 9		Area (Fed.)									
Canal No Name		Total	Barsed	Bd	Wheat	Barseet	Veget	Gard	Cotton	Others	Ri Maize
1 G. Ammar	8273	2108	0	0	99	1150	1500	0	0	3416	1165
2 Ammar Elkebia	5161	1400	0	0	12	1171	411	0	0	2167	1420
3 Ahmad Bastha N.	4543	1820	0	0	0	374	494	234	0	0	1621
4 Ahmad Bastha S.	6349	2650	0	0	185	333	1313	0	0	1868	2300
5 Elsharaha N.	4293	2330	0	0	176	4	373	0	0	1410	2350
6 Elsharaha S.	911	350	0	0	142	0	136	0	0	283	300
7 Pumps	2468	580	0	0	918	0	277	0	0	693	510
8 Abou Romh	268	120	0	0	0	81	0	0	0	67	150
Check Sums:	32266	11358	0	0	1906	3152	4325	0	0	11525	9695
						32266	11358	0	0	1906	3152

Current and Expected Cropping Pattern in Beba Irrigation District (2000)											
Period 8		Area (Fed.)									
Canal No Name		Total	Barsed	Bd	Wheat	Barseet	Veget	Gard	Cotton	Others	Ri Maize
1 G. Ammar	8273	2108	0	0	99	1150	1500	0	0	3416	1165
2 Ammar Elkebia	5161	1400	0	0	12	1171	411	0	0	2167	1420
3 Ahmad Bastha N.	4543	1820	0	0	0	374	494	234	0	0	1621
4 Ahmad Bastha S.	6349	2650	0	0	185	333	1313	0	0	1868	2300
5 Elsharaha N.	4293	2330	0	0	176	4	373	0	0	1410	2350
6 Elsharaha S.	911	350	0	0	142	0	136	0	0	283	300
7 Pumps	2468	580	0	0	918	0	277	0	0	693	510
8 Abou Romh	268	120	0	0	0	81	0	0	0	67	150
Check Sums:	32266	10135	0	0	2032	1867	3309	2373	0	424	12126
						32266	10135	0	0	2032	1867

Check Sums:

Current and Expected Cropping Pattern in Beba Irrigation District (2000)											
Period 9		Area (Fed.)									
Canal No Name		Total	Barsed	Bd	Wheat	Barseet	Veget	Gard	Cotton	Others	Ri Maize

Table 6-4. (Continued).

Current and Expected Cropping Pattern in Beba Irrigation District (2000)																								
Period	11	Area (Fed.)										Water Requirements (m^3/dy)												
		Existing pattern					Expected pattern																	
Canal No.	Name	Total	Barsed	Bt	Wheat	Vegel	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be	Wheat	Vegel	Gard	Cotton	Others	Ri	Maize	Fallow	Check Sums	
1	G. Ammar	8273	0	0	700	94	1176	1130	0	3340	1833	0	0	0	733	94	1176	1115	0	5104	51	224513	260377	8273
2	Ammar Elkebla	5161	0	0	252	10	1219	27	0	1794	1859	0	0	0	274	10	1219	27	0	3631	0	120441	172904	5161
3	Ahmad Basla N.	4543	0	0	259	382	622	7	0	2184	1089	0	0	0	259	382	622	7	0	3196	77	118509	135542	4543
4	Ahmad Basla S.	6349	0	0	367	143	318	1205	0	2723	1593	0	0	0	456	143	318	1201	0	4231	0	158711	189394	6349
5	Eisharahna N.	4293	0	0	126	183	13	0	0	2669	1302	0	0	0	126	183	13	0	0	3971	0	98694	118151	4293
6	Eisharahna S.	911	0	0	139	159	0	0	0	557	56	0	0	0	139	159	0	0	0	613	0	28567	26003	911
7	Pumps	2468	0	0	70	922	0	0	0	1382	94	0	0	0	70	922	0	0	0	1476	0	78941	75494	2468
8	Abou Romh	268	0	0	8	0	0	0	0	132	128	0	0	0	8	0	0	0	0	260	0	4619	7638	268
Check Sums:		32266	0	0	1921	1893	3348	2369	0	14781	7954	0	0	0	2065	1893	3348	2350	0	22482	128	832997	985502	32266
Check Sums:																								

Current and Expected Cropping Pattern in Beba Irrigation District (2000)												Water Requirements (m^3/dy)												
Period	12	Area (Fed.)																						
		Existing pattern					Expected pattern																	
Canal No.	Name	Total	Barsed	Bt	Wheat	Vegel	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be	Wheat	Vegel	Gard	Cotton	Others	Ri	Maize	Fallow	Check Sums	
1	G. Ammar	8273	0	0	1018	79	1174	1263	0	4739	0	0	0	0	79	1174	2183	0	4837	0	257513	270069	8273	
2	Ammar Elkebla	5161	0	0	350	10	1216	8	0	2873	704	0	0	0	350	10	1216	8	0	3576	1	149491	174459	5161
3	Ahmad Basla N.	4543	0	0	184	376	635	4	0	3267	77	0	0	0	160	376	635	0	0	3372	0	135326	143659	4543
4	Ahmad Basla S.	6349	0	0	345	133	320	1195	0	4341	15	0	0	0	345	133	320	1195	0	4356	0	188721	191530	6349
5	Eisharahna N.	4293	0	0	291	183	13	5	0	3800	1	0	0	0	291	183	13	6	0	3800	0	118301	127508	4293
6	Eisharahna S.	911	0	0	76	157	0	0	0	678	0	0	0	0	76	157	0	0	0	678	0	25923	28911	911
7	Pumps	2468	0	0	70	923	0	30	0	1445	0	0	0	0	70	923	0	30	0	1445	0	75494	85389	2468
8	Abou Romh	268	0	0	21	0	0	0	0	247	0	0	0	0	21	0	0	0	0	247	0	7652	7458	268
Check Sums:		32266	0	0	2355	1361	3358	2505	0	21247	940	0	0	0	2331	1861	3358	2451	0	22213	52	953422	1028983	32266
Check Sums:																								

Current and Expected Cropping Pattern in Beba Irrigation District (2000)												Water Requirements (m^3/dy)											
Period	13	Area (Fed.)																					
		Existing pattern					Expected pattern																
Canal No.	Name	Total	Barsed	Bt	Wheat	Vegel	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be	Wheat	Vegel	Gard	Cotton	Others	Ri	Maize	Fallow	Check Sums
1	G. Ammar	8273	0	0	1018	79	1174	1263	0	4739	0	0	0	0	79	1174	2183	0	4837	0	271689	303463	8273
2	Ammar Elkebla	5161	0	0	350	10	1216	9	0	3576	0	0	0	0	10	1216	259	0	3676	0	174491	187479	5161
3	Ahmad Basla N.	4543	0	0	154	376	635	6	0	3372	0	0	0	0	376	635	76	0	3456	0	143652	140459	4543
4	Ahmad Basla S.	6349	0	0	345	133	320	1195	0	4356	0	0	0	0	133	320	1445	0	4451	0	19530	226606	6349
5	Eisharahna N.	4293	0	0	291	183	13	6	0	3800	0	0	0	0	183	13	206	0	3891	0	127508	161130	4293
6	Eisharahna S.	911	0	0	0	157	0	0	0	678	76	0	0	0	157	0	56	0	698	0	26406	34620	911
7	Pumps	2468	0	0	70	923	0	30	0	1445	0	0	0	0	923	0	80	0	1465	0	85589	95014	2468
8	Abou Romh	268	0	0	21	0	0	0	0	247	0	0	0	0	11	0	257	0	7458	9588	268	268	
Check Sums:		32266	0	0	2249	1861	3358	2509	0	22213	76	0	0	0	1861	3358	4316	0	22731	0	1028121	1188359	32266
Check Sums:																							

Table 6-4. (Continued).

Current and Expected Cropping Pattern in Beba Irrigation District (2000)															
Period	14	Area (Fed.)												Water Requirements (m^3/dy)	
		Existing pattern			Barseet			Barsee			Expected pattern				
Canal No.	Name	Total	Barsed	Bt	Wheat	Vege	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be Wheat	Veget Gard Cotton Others Ri Maize Fallow
1	G. Ammar	8273	0	0	920	79	1174	1263	0	4837	0	0	0	79 1174 2183 0 4837 0	
2	Ammar Elkebla	5161	0	0	250	10	1216	9	0	3676	0	0	0	10 1216 259 0 3676 0	
3	Ahmad Bashta N.	4543	0	0	70	376	635	6	0	3456	0	0	0	376 635 76 0 3456 0	
4	Ahmad Bashta S.	6349	0	0	250	133	320	1195	0	4451	0	0	0	133 320 1445 0 4451 0	
5	Eisharahna N.	4293	0	0	200	183	13	6	0	3891	0	0	0	183 13 206 0 3891 0	
6	Eisharahna S.	911	0	0	56	157	0	0	698	0	0	0	157 0 56 0 698 0		
7	Pumps	2468	0	0	50	923	0	30	0	1465	0	0	0	923 0 80 0 1465 0	
8	Abou Romh	268	0	0	11	0	0	0	0	257	0	0	0	0 0 11 0 257 0	
Check Sums:		32266	0	0	1807	1861	3358	2509	0	22731	0	0	0	0 1861 3358 4316 0 22731 0	
Check Sums:														32266	

Current and Expected Cropping Pattern in Beba Irrigation District (2000)														Water Requirements (m^3/dy)		
Period	15	Area (Fed.)													Water Requirements (m^3/dy)	
		Existing pattern			Barseet			Barsee			Expected pattern					
Canal No.	Name	Total	Barsed	Bt	Wheat	Vege	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be Wheat	Veget Gard Cotton Others Ri Maize Fallow	
1	G. Ammar	8273	0	0	0	79	1174	2183	0	4837	0	0	0	79 1174 2183 0 4837 0		
2	Ammar Elkebla	5161	0	0	0	10	1216	259	0	3676	0	0	0	10 1216 259 0 3676 0		
3	Ahmad Bashta N.	4543	0	0	0	376	635	76	0	3456	0	0	0	376 635 76 0 3456 0		
4	Ahmad Bashta S.	6349	0	0	0	133	320	1445	0	4451	0	0	0	133 320 1445 0 4451 0		
5	Eisharahna N.	4293	0	0	0	183	13	206	0	3891	0	0	0	183 13 206 0 3891 0		
6	Eisharahna S.	911	0	0	0	56	157	0	56	0	698	0	0	0 56 0 698 0		
7	Pumps	2468	0	0	0	923	0	80	0	1465	0	0	0	923 0 80 0 1465 0		
8	Abou Romh	268	0	0	0	0	11	0	257	0	0	0	0	0 11 0 257 0		
Check Sums:		32266	0	0	0 1861	3358	4316	0 22731	0	0	0	0	0 1861 3358 4316 0 22731 0	32266		
Check Sums:														32266		

Current and Expected Cropping Pattern in Beba Irrigation District (2000)														Water Requirements (m^3/dy)	
Period	16	Area (Fed.)												Water Requirements (m^3/dy)	
		Existing pattern			Barseet			Barsee			Expected pattern				
Canal No.	Name	Total	Barsed	Bt	Wheat	Vege	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be Wheat	Veget Gard Cotton Others Ri Maize Fallow
1	G. Ammar	8273	0	0	0	79	1174	2183	0	4837	0	0	0	79 1174 2183 0 4837 0	
2	Ammar Elkebla	5161	0	0	0	10	1216	259	0	3676	0	0	0	10 1216 259 0 3676 0	
3	Ahmad Bashta N.	4543	0	0	0	376	635	76	0	3456	0	0	0	376 635 76 0 3456 0	
4	Ahmad Bashta S.	6349	0	0	0	133	320	1445	0	4451	0	0	0	133 320 1445 0 4451 0	
5	Eisharahna N.	4293	0	0	0	183	13	206	0	3891	0	0	0	183 13 206 0 3891 0	
6	Eisharahna S.	911	0	0	0	56	157	0	56	0	698	0	0	0 56 0 698 0	
7	Pumps	2468	0	0	0	923	0	80	0	1465	0	0	0	923 0 80 0 1465 0	
8	Abou Romh	268	0	0	0	0	11	0	257	0	0	0	0	0 11 0 257 0	
Check Sums:		32266	0	0	0 1861	3358	4316	0 22731	0	0	0	0	0 1861 3358 4316 0 22731 0	32266	
Check Sums:														32266	

Table 6-4. (Continued).

Current and Expected Cropping Pattern in Beba Irrigation District (2000)																							
Period		17		Area (Fed.)		Water Requirements (m^3/dy)																	
Canal No	Name	Total	Barsed Bt	Wheat	Bt	Vegetable	Gard	Cotton	Others	Ri Maize	Fallow	Barsee Be	Wheat	Vegetable	Gard	Cotton	Others	Ri Maize	Fallow	0 - 2 wks	2 - 4 wks	Check Sums	
1 G. Ammar		8273	0	0	0	79	750	1619	0	4596	1229	859	0	0	0	79	0	1455	0	1572	4308	255347	
2 Ammar Elkebla		5161	0	0	0	10	1216	361	0	2987	587	431	0	0	0	10	0	63	0	1352	3305	106792	
3 Ahmad Bashta N.		4543	0	0	0	376	635	190	0	3297	45	598	0	0	0	376	0	9	0	2080	1480	8273	
4 Ahmad Bashta S.		6349	0	0	0	0	133	320	451	0	4356	1089	320	0	0	133	0	172	0	2633	3091	5161	
5 Eisharaha N.		4293	0	0	0	0	181	0	254	0	3724	134	2272	0	0	0	181	0	354	0	1055	431	4543
6 Eisharaha S.		911	0	0	0	0	162	0	42	0	666	41	437	0	0	0	162	0	72	0	159	81	6349
7 Pumps		2468	0	0	0	931	0	84	0	1384	69	964	0	0	0	931	0	126	0	281	166	4293	
8 Abou Romh		268	0	0	0	0	0	19	0	237	12	89	0	0	0	0	0	21	0	88	70	911	
Check Sums:		32266	0	0	0	1872	2921	3020	0	21247	3206	5970	0	0	1872	0	2272	0	9220	12932	527983		
																					32266		
Current and Expected Cropping Pattern in Beba Irrigation District (2000)																							
Canal No	Name	Total	Barsed Bt	Wheat	Bt	Vegetable	Gard	Cotton	Others	Ri Maize	Fallow	Barsee Be	Wheat	Vegetable	Gard	Cotton	Others	Ri Maize	Fallow	0 - 2 wks	2 - 4 wks	Check Sums	
1 G. Ammar		8273	400	0	0	79	0	1200	0	1800	4794	1870	0	0	0	79	0	1700	0	680	3944	96908	
2 Ammar Elkebla		5161	610	0	0	10	0	320	0	1120	3101	1250	0	0	0	10	0	1000	0	550	2351	8273	
3 Ahmad Bashta N.		4543	400	0	0	376	0	98	0	1230	2439	1370	0	0	0	376	0	800	0	1300	697	5161	
4 Ahmad Bashta S.		6349	240	0	0	133	0	59	0	1840	4077	1240	0	0	0	133	0	340	0	1250	3386	4543	
5 Eisharaha N.		4293	600	0	0	181	0	80	0	1750	1682	1380	0	0	0	181	0	645	0	880	1207	6349	
6 Eisharaha S.		911	68	0	0	162	0	65	0	576	300	0	0	0	162	0	100	0	62	287	4293		
7 Pumps		2468	125	0	0	931	0	100	0	980	332	870	0	0	0	931	0	250	0	89	328	911	
8 Abou Romh		268	50	0	0	0	30	0	140	48	65	0	0	0	0	0	52	0	27	124	2468		
Check Sums:		32266	0	0	1872	0	1952	0	8900	17049	8345	0	0	1872	0	4838	12324	42121	388527	32266			
Current and Expected Cropping Pattern in Beba Irrigation District (2000)																							
Canal No	Name	Total	Barsed Bt	Wheat	Bt	Vegetable	Gard	Cotton	Others	Ri Maize	Fallow	Barsee Be	Wheat	Vegetable	Gard	Cotton	Others	Ri Maize	Fallow	0 - 2 wks	2 - 4 wks	Check Sums	
1 G. Ammar		8273	1883	0	0	78	0	2250	0	1308	2754	2700	0	0	0	78	0	2138	0	573	2784	103372	
2 Ammar Elkebla		5161	798	0	0	14	0	730	0	1443	2176	1543	0	0	0	14	0	804	0	1375	1425	8273	
3 Ahmad Bashta N.		4543	595	0	0	384	0	461	0	993	2110	1973	0	0	0	384	0	342	0	450	1394	5161	
4 Ahmad Bashta S.		6349	1129	0	0	137	0	401	0	1022	3660	1702	0	0	0	137	0	396	0	618	3496	4543	
5 Eisharaha N.		4293	243	0	0	186	0	704	0	1752	1408	1851	0	0	0	186	0	1060	0	534	662	6349	
6 Eisharaha S.		911	11	0	0	162	0	250	0	221	267	297	0	0	0	162	0	210	0	2	240	4293	
7 Pumps		2468	149	0	0	931	0	454	0	144	790	557	0	0	0	931	0	412	0	11	557	911	
8 Abou Romh		268	37	0	0	0	47	0	40	144	168	0	0	0	0	0	38	0	0	62	2468		
Check Sums:		32266	4845	0	0	1892	0	5297	0	6323	13309	10791	0	0	1892	0	5400	0	3563	10620	389290		
																					32266		

Table 6-4. (Continued).

Current and Expected Cropping Pattern in Beba Irrigation District (2000)																									
Period	20	Area (Fed.)										Water Requirements (m^3/dy)													
		Existing pattern					Expected pattern																		
Canal No.	Name	Total	Barsed	Bd	Wheat	Vege	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Bt	Wheat	Veget	Gard	Cotton	Others	Ri	Maize	Fallow	0 - 2 wks	2 - 4 wks	Check Sums
1	G. Ammar	8273	2700	0	0	78	0	2120	0	520	2855	3500	0	0	0	78	0	2300	0	0	2395	89914	86752	8273	
2	Ammar Elkebia	5161	1650	0	0	14	0	750	0	1100	1647	1970	0	0	0	14	0	860	0	0	2317	58639	40345	5161	
3	Ahmad Bashta N.	4543	2120	0	0	400	0	350	0	420	1253	2350	0	0	400	0	380	0	0	1413	59225	43916	4543		
4	Ahmad Bashta S.	6349	3200	0	0	137	0	350	0	422	2240	3673	0	0	0	137	0	450	0	0	2089	683320	57688	6349	
5	Eisharahna N.	4293	1720	0	0	186	0	950	0	330	1107	2230	0	0	0	186	0	1110	0	0	767	62739	49946	4293	
6	Eisharahna S.	911	290	0	0	162	0	230	0	12	217	380	0	0	0	162	0	170	0	0	199	14357	10533	911	
7	Pumps	2468	607	0	0	931	0	370	0	50	510	825	0	0	0	931	0	325	0	0	387	4137	32502	2468	
8	Abou Romh	268	160	0	0	0	0	25	0	0	83	180	0	0	0	0	0	0	0	0	60	2935	268	268	
Check Sums:		32266	12447	0	0	1908	0	5145	0	2854	9912	15108	0	0	0	1908	0	5623	0	0	9627	397483	324621	32266	

Current and Expected Cropping Pattern in Beba Irrigation District (2000)												Water Requirements (m^3/dy)													
Period	21	Area (Fed.)																							
		Existing pattern					Expected pattern																		
Canal No.	Name	Total	Barsed	Bd	Wheat	Vege	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Bt	Wheat	Veget	Gard	Cotton	Others	Ri	Maize	Fallow	0 - 2 wks	2 - 4 wks	Check Sums
1	G. Ammar	8273	3000	0	0	78	0	2200	0	0	2995	3500	0	695	0	78	0	2300	0	0	1700	77802	92022	8273	
2	Ammar Elkebia	5161	1630	0	0	14	0	820	0	0	2697	1970	0	500	0	14	0	860	0	0	1817	35896	46816	5161	
3	Ahmad Bashta N.	4543	2050	0	0	400	0	350	0	0	1743	2350	0	313	0	400	0	380	0	0	1100	41303	48202	4543	
4	Ahmad Bashta S.	6349	3450	0	0	137	0	420	0	0	2342	3673	0	560	0	137	0	450	0	0	1529	57311	67480	6349	
5	Eisharahna N.	4293	2120	0	0	186	0	950	0	0	1037	2230	0	150	0	186	0	1110	0	0	617	47854	51464	4293	
6	Eisharahna S.	911	350	0	0	162	0	150	0	0	249	380	0	39	0	162	0	170	0	0	160	10133	10514	911	
7	Pumps	2468	750	0	0	931	0	250	0	0	537	825	0	87	0	931	0	325	0	0	300	31001	30352	2468	
8	Abou Romh	268	160	0	0	0	0	25	0	0	83	180	0	10	0	0	0	28	0	0	50	2631	3052	268	
Check Sums:		32266	13510	0	0	1908	0	5165	0	0	11683	15108	0	2354	0	1908	0	5623	0	0	7273	303931	349902	32266	

Current and Expected Cropping Pattern in Beba Irrigation District (2000)												Water Requirements (m^3/dy)													
Period	22	Area (Fed.)																							
		Existing pattern					Expected pattern																		
Canal No.	Name	Total	Barsed	Bd	Wheat	Vege	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Bt	Wheat	Veget	Gard	Cotton	Others	Ri	Maize	Fallow	0 - 2 wks	2 - 4 wks	Check Sums
1	G. Ammar	8273	2963	0	1362	0	78	0	1764	0	0	2106	3294	0	3137	0	78	0	1764	0	0	0	86338	115838	8273
2	Ammar Elkebia	5161	2333	0	1213	0	29	0	396	0	0	1190	2333	0	2403	0	29	0	396	0	0	0	55594	72254	5161
3	Ahmad Bashta N.	4543	2333	0	230	0	462	0	179	0	0	1339	2362	0	1395	0	462	0	324	0	0	0	44856	63602	4543
4	Ahmad Bashta S.	6349	3674	0	664	0	195	0	335	0	0	1481	3712	0	2059	0	195	0	383	0	0	0	68152	88866	6349
5	Eisharahna N.	4293	2337	0	463	0	181	0	0	0	0	1312	2337	0	1312	0	181	0	463	0	0	0	41734	60102	4293
6	Eisharahna S.	911	301	0	83	0	162	0	0	0	0	365	301	0	238	0	162	0	0	0	0	7644	12754	911	
7	Pumps	2468	617	0	315	0	945	0	0	0	591	617	0	650	0	945	0	286	0	0	0	26278	34552	2468	
8	Abou Romh	268	130	0	29	0	0	0	0	0	109	130	0	94	0	0	0	44	0	0	0	2226	3752	268	
Check Sums:		32266	14688	0	4359	0	2052	0	2674	0	0	8493	15086	0	11288	0	2052	0	3840	0	0	0	332822	451174	32266

Table 6-4. (Continued).

Current and Expected Cropping Pattern in Beba Irrigation District (2000)																							
Period	23		Area (Fed.)						Water Requirements (m^3/dy)														
	Canal No	Name	Total	Barsed	Bt	Wheat	Veget	Gard	Cotton	Others	Ri Maize	Fallow	Expected pattern	Barsee	Be Wheat	Veget	Gard	Cotton	Others	Ri Maize	Fallow	Check Sums	
1	G. Ammar	8273	3480	0	3159	0	87	0	1547	0	0	0	3480	0	3159	0	87	0	1547	0	0	115822	8273
2	Ammar Elkebla	5161	2448	0	2286	0	33	0	394	0	0	0	2448	0	2286	0	33	0	394	0	0	72254	5161
3	Ahmad Basla N.	4543	2297	0	1352	0	452	0	442	0	0	0	2297	0	1352	0	452	0	442	0	0	63602	4543
4	Ahmad Basla S.	6349	3796	0	1954	0	201	0	398	0	0	0	3796	0	1954	0	201	0	398	0	0	88886	6349
5	Eisharahna N.	4293	2462	0	1354	0	181	0	296	0	0	0	2462	0	1354	0	181	0	296	0	0	60102	4293
6	Eisharahna S.	911	370	0	305	0	162	0	74	0	0	0	370	0	305	0	162	0	74	0	0	12754	911
7	Pumps	2468	647	0	707	0	945	0	169	0	0	0	647	0	707	0	945	0	169	0	0	34552	2468
8	Abou Romh	268	137	0	124	0	0	0	7	0	0	0	137	0	124	0	0	0	7	0	0	3752	268
Check Sums:		32266	15637	0	11241	0	2061	0	3327	0	0	0	15637	0	11241	0	2061	0	3327	0	0	32266	32266

Current and Expected Cropping Pattern in Beba Irrigation District (2000)																							
Period	24		Area (Fed.)						Water Requirements (m^3/dy)														
	Canal No	Name	Total	Barsed	Bt	Wheat	Veget	Gard	Cotton	Others	Ri Maize	Fallow	Expected pattern	Barsee	Be Wheat	Veget	Gard	Cotton	Others	Ri Maize	Fallow	Check Sums	
1	G. Ammar	8273	3480	0	3159	0	87	0	1547	0	0	0	3480	0	3159	0	87	0	1547	0	0	105883	8273
2	Ammar Elkebla	5161	2448	0	2286	0	33	0	394	0	0	0	2448	0	2286	0	33	0	394	0	0	67738	5161
3	Ahmad Basla N.	4543	2297	0	1352	0	452	0	442	0	0	0	2297	0	1352	0	452	0	442	0	0	59627	4543
4	Ahmad Basla S.	6349	3796	0	1954	0	201	0	398	0	0	0	3796	0	1954	0	201	0	398	0	0	83331	6349
5	Eisharahna N.	4293	2462	0	1354	0	181	0	296	0	0	0	2462	0	1354	0	181	0	296	0	0	60102	4293
6	Eisharahna S.	911	370	0	305	0	162	0	74	0	0	0	370	0	305	0	162	0	74	0	0	1957	911
7	Pumps	2468	647	0	707	0	945	0	169	0	0	0	647	0	707	0	945	0	169	0	0	32393	2468
8	Abou Romh	268	137	0	124	0	0	0	7	0	0	0	137	0	124	0	0	0	7	0	0	3518	268
Check Sums:		32266	15637	0	11241	0	2061	0	3327	0	0	0	15637	0	11241	0	2061	0	3327	0	0	423491	451724

Current and Expected Cropping Pattern in Beba Irrigation District (2001)																							
Period	1		Area (Fed.)						Water Requirements (m^3/dy)														
	Canal No	Name	Total	Barsed	Bt	Wheat	Veget	Gard	Cotton	Others	Ri Maize	Fallow	Expected pattern	Barsee	Be Wheat	Veget	Gard	Cotton	Others	Ri Maize	Fallow	Check Sums	
1	G. Ammar	8273	3480	0	3159	0	87	0	1547	0	0	0	3480	0	3159	0	87	0	1547	0	0	115822	8273
2	Ammar Elkebla	5161	2448	0	2286	0	33	0	394	0	0	0	2448	0	2286	0	33	0	394	0	0	72254	5161
3	Ahmad Basla N.	4543	2297	0	1352	0	452	0	442	0	0	0	2297	0	1352	0	452	0	442	0	0	63602	4543
4	Ahmad Basla S.	6349	3796	0	1954	0	201	0	398	0	0	0	3796	0	1954	0	201	0	398	0	0	88886	6349
5	Eisharahna N.	4293	2462	0	1354	0	181	0	296	0	0	0	2462	0	1354	0	181	0	296	0	0	60102	4293
6	Eisharahna S.	911	370	0	305	0	162	0	74	0	0	0	370	0	305	0	162	0	74	0	0	12754	911
7	Pumps	2468	647	0	707	0	945	0	169	0	0	0	647	0	707	0	945	0	169	0	0	34552	2468
8	Abou Romh	268	137	0	124	0	0	0	7	0	0	0	137	0	124	0	0	0	7	0	0	3752	268
Check Sums:		32266	15637	0	11241	0	2061	0	3327	0	0	0	15637	0	11241	0	2061	0	3327	0	0	423491	451724

Current and Expected Cropping Pattern in Beba Irrigation District (2001)																							
Period	2		Area (Fed.)						Water Requirements (m^3/dy)														
	Canal No	Name	Total	Barsed	Bt	Wheat	Veget	Gard	Cotton	Others	Ri Maize	Fallow	Expected pattern	Barsee	Be Wheat	Veget	Gard	Cotton	Others	Ri Maize	Fallow	Check Sums	
1	G. Ammar	8273	3480	0	3159	0	87	0	1547	0	0	0	3480	0	3159	0	87	0	1547	0	0	115822	8273
2	Ammar Elkebla	5161	2448	0	2286	0	33	0	394	0	0	0	2448	0	2286	0	33	0	394	0	0	72254	5161
3	Ahmad Basla N.	4543	2297	0	1352	0	452	0	442	0	0	0	2297	0	1352	0	452	0	442	0	0	63602	4543
4	Ahmad Basla S.	6349	3796	0	1954	0	201	0	398	0	0	0	3796	0	1954	0	201	0	398	0	0	88886	6349
5	Eisharahna N.	4293	2462	0	1354	0	181	0	296	0	0	0	2462	0	1354	0	181	0	296	0	0	60102	4293
6	Eisharahna S.	911	370	0	305	0	162	0	74	0	0	0	370	0	305	0	162	0	74	0	0	12754	911
7	Pumps	2468	647	0	707	0	945	0	169	0	0	0	647	0	707	0	945	0	169	0	0	34552	2468
8	Abou Romh	268	137	0	124	0	0	0	7	0	0	0	137	0	124	0	0	0	7	0	0	3752	268
Check Sums:		32266	15637	0	11241	0	2061	0	3327	0	0	0	15637	0	11241	0	2061	0	3327	0	0	423491	451724

Table 6-4. (Continued).

Current and Expected Cropping Pattern in Beba Irrigation District (2001)

Period	2	Area (Fed.)										Water Requirements (m^3/dy)												
		Existing pattern					Expected pattern					0 - 2 wks		2 - 4 wks										
Canal No	Name	Total	Barsed	Bt	Wheat	Vege	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be	Wheat	Veget	Gard	Cotton	Others	Ri	Maize	Fallow	Check Sums	
1	G. Ammar	8273	3480	0	3159	0	87	0	1547	0	0	0	3480	0	3159	0	87	0	1547	0	0	0	108583	121081
2	Ammar Elkebia	5161	2448	0	2286	0	33	0	394	0	0	0	2448	0	2286	0	33	0	394	0	0	0	67738	77094
3	Ahmad Bashta N.	4543	2297	0	1352	0	452	0	442	0	0	0	2297	0	1352	0	452	0	442	0	0	0	56627	65098
4	Ahmad Bashta S.	6349	3796	0	1954	0	201	0	398	0	0	0	3796	0	1954	0	201	0	398	0	0	0	83331	91741
5	Eisharaha N.	4293	2462	0	1354	0	181	0	296	0	0	0	2462	0	1354	0	181	0	296	0	0	0	56346	62110
6	Eisharaha S.	911	370	0	305	0	162	0	74	0	0	0	370	0	305	0	162	0	74	0	0	0	11957	13187
7	Pumps	2468	647	0	707	0	945	0	169	0	0	0	647	0	707	0	945	0	169	0	0	0	32393	35635
8	Abou Romh	268	137	0	124	0	0	0	7	0	0	0	137	0	124	0	0	0	7	0	0	0	3967	2468
Check Sums:		32266	15637	0	11241	0	2061	0	3327	0	0	0	15637	0	11241	0	2061	0	3327	0	0	0	423491	469882
Check Sums:																							32266	32266

Current and Expected Cropping Pattern in Beba Irrigation District (2001)

Period	3	Area (Fed.)										Water Requirements (m^3/dy)													
		Existing pattern					Expected pattern					0 - 2 wks		2 - 4 wks											
Canal No	Name	Total	Barsed	Bt	Wheat	Vege	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be	Wheat	Veget	Gard	Cotton	Others	Ri	Maize	Fallow	Check Sums		
1	G. Ammar	8273	2130	0	3159	0	87	0	1547	0	0	0	1350	2130	0	3159	0	87	0	1547	0	0	0	104650	120444
2	Ammar Elkebia	5161	1498	0	2286	0	33	0	394	0	0	0	950	1498	0	2286	0	33	0	394	0	0	0	950	64912
3	Ahmad Bashta N.	4543	1747	0	1352	0	452	0	442	0	0	0	550	1747	0	1352	0	452	0	442	0	0	0	550	58642
4	Ahmad Bashta S.	6349	3146	0	1954	0	201	0	398	0	0	0	650	3146	0	1954	0	201	0	398	0	0	0	650	97855
5	Eisharaha N.	4293	2462	0	1354	0	181	0	296	0	0	0	6462	0	1354	0	181	0	296	0	0	0	63220	73206	
6	Eisharaha S.	911	370	0	305	0	162	0	74	0	0	0	370	0	305	0	162	0	74	0	0	0	13422	15587	
7	Pumps	2468	647	0	707	0	945	0	169	0	0	0	647	0	707	0	945	0	169	0	0	0	36298	41791	
8	Abou Romh	268	137	0	124	0	0	0	7	0	0	0	137	0	124	0	0	0	7	0	0	0	4016	4760	
Check Sums:		32266	12137	0	11241	0	2061	0	3327	0	0	0	3500	12137	0	11241	0	2061	0	3327	0	0	0	423441	497680
Check Sums:																							32266	32266	

Current and Expected Cropping Pattern in Beba Irrigation District (2001)

Period	4	Area (Fed.)										Water Requirements (m^3/dy)													
		Existing pattern					Expected pattern					0 - 2 wks		2 - 4 wks											
Canal No	Name	Total	Barsed	Bt	Wheat	Vege	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be	Wheat	Veget	Gard	Cotton	Others	Ri	Maize	Fallow	Check Sums		
1	G. Ammar	8273	2130	0	3159	0	87	0	1547	0	0	0	1350	2130	0	3159	0	87	0	1547	0	0	0	1350	124366
2	Ammar Elkebia	5161	1498	0	2286	0	33	0	394	0	0	0	950	1498	0	2286	0	33	0	394	0	0	0	950	89707
3	Ahmad Bashta N.	4543	1747	0	1352	0	452	0	442	0	0	0	550	1747	0	1352	0	452	0	442	0	0	0	550	56973
4	Ahmad Bashta S.	6349	3146	0	1954	0	201	0	398	0	0	0	650	3146	0	1954	0	201	0	398	0	0	0	650	99776
5	Eisharaha N.	4293	2462	0	1354	0	181	0	296	0	0	0	2462	0	1354	0	181	0	296	0	0	0	74695	86572	
6	Eisharaha S.	911	370	0	305	0	162	0	74	0	0	0	370	0	305	0	162	0	74	0	0	0	15916	18438	
7	Pumps	2468	647	0	707	0	945	0	169	0	0	0	647	0	707	0	945	0	169	0	0	0	42675	49397	
8	Abou Romh	268	137	0	124	0	0	0	7	0	0	0	137	0	124	0	0	0	7	0	0	0	4816	5638	
Check Sums:		32266	12137	0	11241	0	2061	0	3327	0	0	0	3500	12137	0	11241	0	2061	0	3327	0	0	0	423441	497680
Check Sums:																							32266	32266	

Table 6-4. (Continued).

Current and Expected Cropping Pattern in Beba Irrigation District (2001)

Period	5	Area (Fed.)												Water Requirements (m^3/dy)															
		Existing pattern				Expected pattern				Barsee Be Wheat Veget Gard Cotton Others Ri Maize Fallow				0 - 2 wks		2 - 4 wks													
Canal No	Name	Total	Barsed	Bl	Wheat	Veget	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be	Wheat	Veget	Gard	Cotton	Others	Ri	Maize	Fallow	0	661	141475	171272	Check Sums Existing	Check Sums Expected	
1	G. Ammar	8273	25566	0	3173	0	85	0	875	0	0	1584	25566	0	3173	0	85	923	875	0	0	661	86669	119338	8273	8273			
2	Ammar Elkebia	5161	1489	0	2286	0	33	0	333	0	0	1020	1489	0	2286	0	33	1020	333	0	0	0	0	0	5161	5161	5161	5161	
3	Ahmad Bashta N.	4543	1590	0	1352	0	452	0	442	0	0	707	1590	0	1352	0	452	707	442	0	0	0	0	0	100959	4543	4543	4543	
4	Ahmad Bashta S.	6349	3443	0	1954	0	201	0	370	0	0	381	3443	0	1954	0	201	381	370	0	0	0	0	0	121561	139964	6349	6349	
5	Eisharaha N.	4293	2449	0	1354	0	181	0	296	0	0	13	2449	0	1354	0	181	13	296	0	0	0	0	0	0	86461	96700	4293	4293
6	Eisharaha S.	911	370	0	305	0	162	0	74	0	0	0	370	0	305	0	162	0	74	0	0	0	0	0	0	18466	20597	911	911
7	Pumps	2468	647	0	707	0	945	0	169	0	0	647	0	707	0	945	0	169	0	0	0	0	0	0	55183	2468	55183	2468	
8	Abou Romh	268	137	0	124	0	0	0	7	0	0	0	137	0	124	0	0	0	7	0	0	0	0	0	0	5646	6298	268	268
Check Sums:		32266	12681	0	11255	0	2059	0	2566	0	0	3705	12681	0	11255	0	2059	3044	2566	0	661	589561	710312	32266	32266				

Current and Expected Cropping Pattern in Beba Irrigation District (2001)

Period	6	Area (Fed.)												Water Requirements (m^3/dy)															
		Existing pattern				Expected pattern				Barsee Be Wheat Veget Gard Cotton Others Ri Maize Fallow				0 - 2 wks		2 - 4 wks													
Canal No	Name	Total	Barsed	Bl	Wheat	Veget	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be	Wheat	Veget	Gard	Cotton	Others	Ri	Maize	Fallow	0	0	164954	246247	Check Sums Existing	Check Sums Expected	
1	G. Ammar	8273	25566	0	3173	0	85	0	1536	0	0	923	25566	0	3173	0	85	923	1536	0	0	0	0	0	86461	156208	5161	5161	
2	Ammar Elkebia	5161	1489	0	2286	0	33	0	333	0	0	1020	1489	0	2286	0	33	1020	333	0	0	0	0	0	86461	86838	4543	4543	
3	Ahmad Bashta N.	4543	1590	0	1352	0	452	0	442	0	0	707	1590	0	1352	0	452	707	442	0	0	0	0	0	132403	190355	6349	6349	
4	Ahmad Bashta S.	6349	3443	0	1954	0	201	0	370	0	0	381	3443	0	1954	0	201	381	370	0	0	0	0	0	96493	131551	4293	4293	
5	Eisharaha N.	4293	2449	0	1354	0	181	0	296	0	0	13	2449	0	1354	0	181	13	296	0	0	0	0	0	20609	28024	911	911	
6	Eisharaha S.	911	370	0	305	0	162	0	74	0	0	0	370	0	305	0	162	0	74	0	0	0	0	0	55214	75101	2468	2468	
7	Pumps	2468	647	0	707	0	945	0	169	0	0	647	0	707	0	945	0	169	0	0	0	0	0	0	6301	8572	268	268	
8	Abou Romh	268	137	0	124	0	0	0	7	0	0	0	137	0	124	0	0	0	7	0	0	0	0	0	0	661762	969414	32266	32266
Check Sums:		32266	12681	0	11255	0	2059	0	3227	0	0	3044	12681	0	11255	0	2059	3044	3227	0	0	0	0	32266	32266	32266	32266		

Current and Expected Cropping Pattern in Beba Irrigation District (2001)

Period	7	Area (Fed.)												Water Requirements (m^3/dy)														
		Existing pattern				Expected pattern				Barsee Be Wheat Veget Gard Cotton Others Ri Maize Fallow				0 - 2 wks		2 - 4 wks												
Canal No	Name	Total	Barsed	Bl	Wheat	Veget	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be	Wheat	Veget	Gard	Cotton	Others	Ri	Maize	Fallow	0	0	246951	247887	Check Sums Existing	Check Sums Expected
1	G. Ammar	8273	25566	0	3173	0	85	0	1536	0	0	923	25566	0	3173	0	85	980	1490	0	0	0	0	0	146356	156231	5161	5161
2	Ammar Elkebia	5161	1195	0	2286	0	33	0	333	0	0	1195	0	2286	0	33	1314	333	0	0	0	0	0	0	136628	135582	4543	4543
3	Ahmad Bashta N.	4543	1590	0	1352	0	452	0	442	0	0	1590	0	1352	0	452	810	339	0	0	0	0	0	0	196609	197484	6349	6349
4	Ahmad Bashta S.	6349	3443	0	1954	0	201	0	381	0	0	3434	0	1954	0	201	390	370	0	0	0	0	0	0	131543	137035	4293	4293
5	Eisharaha N.	4293	2449	0	1354	0	181	0	309	0	0	2449	0	1354	0	181	0	309	0	0	0	0	0	0	28030	29331	911	911
6	Eisharaha S.	911	370	0	305	0	162	0	74	0	0	370	0	305	0	162	0	74	0	0	0	0	0	0	75070	77784	2468	2468
7	Pumps	2468	647	0	707	0	945	0	169	0	0	647	0	707	0	945	0	169	0	0	0	0	0	0	5569	8924	268	268
8	Abou Romh	268	137	0	124	0	0	0	7	0	0	137	0	124	0	0	0	7	0	0	0	0	0	0	966631	980352	32266	32266
Check Sums:		32266	12387	0	11255	0	2059	3428	3137	0	0	0	12367	0	11255	0	2059	3494	3091	0	0	0	0	0	966631	980352	32266	32266

Table 6-4. (Continued).

Current and Expected Cropping Pattern in Beba Irrigation District (2001)

Period 8		Area (Fed.)												Water Requirements (m^3/dy)										
Canal No	Name	Total	Barsed	Bt	Wheat	Vegetable	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be	Wheat	Gard	Cotton	Others	Ri	Maize	Fallow	0 - 2 wks	2 - 4 wks	Check Sums
1 G. Ammar	8273	2100	0	0	85	1043	1500	0	0	3545	1800	0	0	0	85	1043	1600	0	0	3745	126374	126488	8273	
2 Ammar Elkebia	5161	930	0	0	33	1334	350	0	0	2514	735	0	0	0	33	1334	380	0	0	2679	61500	61292	5161	
3 Ahmad Bashta N.	4543	1120	0	0	452	810	340	0	0	1821	1080	0	0	0	452	810	351	0	0	1850	75179	75179	4543	
4 Ahmad Bashta S.	6349	3300	0	0	201	398	280	0	0	2170	3270	0	0	0	201	398	311	0	0	2169	121383	128930	6349	
5 Eisharaha N.	4293	2420	0	0	181	0	309	0	0	1383	2330	0	0	0	181	0	320	0	0	1462	87825	90457	4293	
6 Eisharaha S.	911	370	0	0	162	0	75	0	0	304	320	0	0	0	162	0	82	0	0	347	18280	17949	911	
7 Pumps	2468	640	0	0	945	0	180	0	0	703	610	0	0	0	945	0	189	0	0	724	52397	55757	2468	
8 Abou Romh	268	135	0	0	0	0	8	0	0	125	110	0	0	0	0	0	10	0	0	148	4343	3848	268	
Check Sums:	32266	11015	0	0	2059	3585	3042	0	0	12565	10255	0	0	0	2059	3585	3243	0	0	13124	542880	559881	32266	
Check Sums:																								

Current and Expected Cropping Pattern in Beba Irrigation District (2001)

Period 9		Area (Fed.)												Water Requirements (m^3/dy)										Check Sums
Canal No	Name	Total	Barsed	Bt	Wheat	Vegetable	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be	Wheat	Gard	Cotton	Others	Ri	Maize	Fallow	0 - 2 wks	2 - 4 wks	Check Sums
1 G. Ammar	8273	1500	0	0	85	1043	1650	0	250	3745	1100	0	0	0	85	1043	1650	0	730	3665	126060	135918	8273	
2 Ammar Elkebia	5161	750	0	0	33	1334	380	0	135	2529	450	0	0	0	33	1334	380	0	450	2514	66038	75983	5161	
3 Ahmad Bashta N.	4543	1000	0	0	452	810	351	0	400	1530	600	0	0	0	452	810	361	0	750	1580	88211	86834	4543	
4 Ahmad Bashta S.	6349	1239	0	0	201	398	311	0	400	3800	1600	0	0	0	201	398	311	0	950	2889	75750	96259	6349	
5 Eisharaha N.	4293	2030	0	0	181	0	200	0	200	1562	1700	0	0	0	181	0	200	0	530	1682	87424	82205	4293	
6 Eisharaha S.	911	200	0	0	162	0	82	0	120	347	92	0	0	0	162	0	82	0	191	384	17848	15672	911	
7 Pumps	2468	500	0	0	945	0	190	0	133	700	400	0	0	0	945	0	190	0	200	733	56419	55516	2468	
8 Abou Romh	268	100	0	0	0	0	10	0	20	138	70	0	0	0	0	0	0	15	0	60	123	4156	4477	268
Check Sums:	32266	7319	0	0	2059	3585	3174	0	1778	14351	6012	0	0	0	2059	3585	3179	0	3861	13570	518906	552866	32266	
Check Sums:																								

Current and Expected Cropping Pattern in Beba Irrigation District (2001)

Period 10		Area (Fed.)												Water Requirements (m^3/dy)										Check Sums
Canal No	Name	Total	Barsed	Bt	Wheat	Vegetable	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be	Wheat	Gard	Cotton	Others	Ri	Maize	Fallow	0 - 2 wks	2 - 4 wks	Check Sums
1 G. Ammar	8273	900	0	0	85	1043	1650	0	650	3945	0	0	0	0	85	1043	1650	0	2600	2895	126144	173908	8273	
2 Ammar Elkebia	5161	420	0	0	33	1334	380	0	360	2634	0	0	0	0	33	1334	380	0	1800	1614	71811	119178	5161	
3 Ahmad Bashta N.	4543	620	0	0	452	810	351	0	620	1690	0	0	0	0	452	810	351	0	1385	1545	83066	100874	4543	
4 Ahmad Bashta S.	6349	1400	0	0	201	398	311	0	750	3289	0	0	0	0	201	398	311	0	1850	3589	87315	88090	6349	
5 Eisharaha N.	4293	1500	0	0	181	0	200	0	487	1925	0	0	0	0	181	0	200	0	1321	2591	73918	53592	4293	
6 Eisharaha S.	911	90	0	0	162	0	82	0	170	407	0	0	0	0	162	0	82	0	237	430	14871	157112	911	
7 Pumps	2468	320	0	0	945	0	190	0	185	828	0	0	0	0	945	0	190	0	545	788	52291	57684	2468	
8 Abou Romh	268	50	0	0	0	0	15	0	50	153	0	0	0	0	15	0	80	0	173	3448	2760	268	268	
Check Sums:	32266	5300	0	0	2059	3585	3179	0	3272	14871	0	0	0	0	2059	3585	3179	0	9818	13625	512865	611799	32266	
Check Sums:																								

Table 6-4. (Continued).

Current and Expected Cropping Pattern in Beba Irrigation District (2001)																							
Period	11	Area (Fed.)										Water Requirements (m^3/dy)											
		Existing pattern					Expected pattern																
Canal No.	Name	Total	Barsed	Bt	Wheat	Vegel	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be	Wheat	Vegel	Gard	Cotton	Others	Ri	Maize	Fallow	Check Sums
1	G. Ammar	8273	120	0	0	85	1043	2859	0	4166	0	0	0	0	85	1043	1428	0	4166	1551	271470	206775	8273
2	Ammar Elkebla	5161	60	0	0	14	1334	691	0	3062	0	0	0	0	14	1334	491	0	3062	260	174203	157544	5161
3	Ahmad Basla N.	4543	80	0	0	454	810	387	0	2812	0	0	0	0	454	776	501	0	2812	0	151278	148163	4543
4	Ahmad Basla S.	6349	150	0	0	201	398	997	0	4603	0	0	0	0	201	398	860	0	4603	287	207146	175570	6349
5	Eisharahna N.	4293	20	0	0	167	0	1456	0	2650	0	0	0	0	167	0	289	0	3757	80	139205	123916	4293
6	Eisharahna S.	911	30	0	0	192	0	170	0	519	0	0	0	0	192	0	200	0	519	0	30136	29306	911
7	Pumps	2468	40	0	0	972	0	103	0	1353	0	0	0	0	970	0	145	0	1353	0	84450	76775	2468
8	Abou Romh	268	10	0	0	1	0	6	0	251	0	0	0	0	1	0	6	0	251	10	8551	6874	268
Check Sums:		32266	510	0	0	2086	3585	6669	0	19416	0	0	0	0	2084	3551	3920	0	20523	2188	1066441	924923	32266

Current and Expected Cropping Pattern in Beba Irrigation District (2001)												Water Requirements (m^3/dy)											
Period	12	Area (Fed.)																					
		Existing pattern					Expected pattern																
Canal No.	Name	Total	Barsed	Bt	Wheat	Vegel	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be	Wheat	Vegel	Gard	Cotton	Others	Ri	Maize	Fallow	Check Sums
1	G. Ammar	8273	0	0	0	85	1043	2859	0	4166	120	0	0	0	85	1043	2359	0	4666	120	254256	285654	8273
2	Ammar Elkebla	5161	0	0	0	14	1334	691	0	3062	60	0	0	0	14	1334	491	0	3162	160	164180	185815	5161
3	Ahmad Basla N.	4543	0	0	0	454	810	387	0	2812	80	0	0	0	454	810	387	0	2872	20	146006	168290	4543
4	Ahmad Basla S.	6349	0	0	0	201	398	997	0	4603	150	0	0	0	201	398	997	0	4703	50	180116	218316	6349
5	Eisharahna N.	4293	0	0	0	167	0	356	0	3757	13	0	0	0	167	0	289	0	3797	40	126139	132794	4293
6	Eisharahna S.	911	0	0	0	192	0	200	0	519	0	0	0	0	192	0	200	0	519	0	23206	32367	911
7	Pumps	2468	0	0	0	970	0	145	0	1353	0	0	0	0	970	0	145	0	1353	0	76775	85440	2468
8	Abou Romh	268	0	0	0	1	0	6	0	251	10	0	0	0	1	0	6	0	261	0	6874	9222	268
Check Sums:		32266	0	0	0	2084	3585	5641	0	20523	433	0	0	0	2084	3585	4874	0	21333	390	983651	1117897	32266

Current and Expected Cropping Pattern in Beba Irrigation District (2001)												Water Requirements (m^3/dy)											
Period	13	Area (Fed.)																					
		Existing pattern					Expected pattern																
Canal No.	Name	Total	Barsed	Bt	Wheat	Vegel	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be	Wheat	Vegel	Gard	Cotton	Others	Ri	Maize	Fallow	Check Sums
1	G. Ammar	8273	0	0	0	85	1043	2179	0	4986	0	0	0	0	85	1043	2179	0	4966	0	289775	308465	8273
2	Ammar Elkebla	5161	0	0	0	14	1334	431	0	3352	0	0	0	0	14	1334	431	0	3382	0	19123	209770	5161
3	Ahmad Basla N.	4543	0	0	0	454	810	197	0	3052	0	0	0	0	454	810	197	0	3082	0	169143	183424	4543
4	Ahmad Basla S.	6349	0	0	0	201	398	767	0	4983	0	0	0	0	201	398	767	0	4983	0	220193	250728	6349
5	Eisharahna N.	4293	0	0	0	167	0	391	0	3735	0	0	0	0	167	0	391	0	3735	0	134041	161903	4293
6	Eisharahna S.	911	0	0	0	192	0	190	0	529	0	0	0	0	192	0	190	0	529	0	34701	32378	911
7	Pumps	2468	0	0	0	972	0	60	0	1436	0	0	0	0	972	0	60	0	1436	0	85534	93775	2468
8	Abou Romh	268	0	0	0	1	0	6	0	261	0	0	0	0	1	0	6	0	261	0	9222	11085	268
Check Sums:		32266	0	0	0	2086	3585	4221	0	22374	0	0	0	0	2086	3585	4221	0	22374	0	113409	1253851	32266

Table 6-4. (Continued).

Current and Expected Cropping Pattern in Beba Irrigation District (2001)																							
Period	14	Area (Fed.)										Water Requirements (m^3/dy)											
		Existing pattern					Expected pattern																
Canal No.	Name	Total	Barsed	Bt	Wheat	Vegel	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be	Wheat	Vegel	Gard	Cotton	Others	Ri	Maize	Fallow	Check Sums
1	G. Ammar	8273	0	0	85	1043	2029	0	5116	0	0	0	0	85	1043	2029	0	4666	450	3023	16	8273	8273
2	Ammar Elkebla	5161	0	0	8	1334	277	0	3542	0	0	0	0	8	1334	277	0	3142	400	200184	5161	5161	5161
3	Ahmad Basla N.	4543	0	0	0	454	810	147	0	3132	0	0	0	454	810	147	0	2882	250	183470	178508	4543	4543
4	Ahmad Basla S.	6349	0	0	0	201	398	747	0	5003	0	0	0	201	398	747	0	4703	300	250746	249532	6349	6349
5	Eisharahna N.	4293	0	0	0	167	0	336	0	3790	0	0	0	167	0	336	0	3540	250	161962	167884	4293	4293
6	Eisharahna S.	911	0	0	0	182	0	155	0	574	0	0	0	182	0	155	0	544	30	34701	33486	911	911
7	Pumps	2468	0	0	0	972	0	43	0	1453	0	0	0	972	0	43	0	1393	60	93791	94064	2468	2468
8	Abou Romh	268	0	0	0	1	0	6	0	261	0	0	0	1	0	6	0	261	0	11658	268	268	268
Check Sums:		32266	0	0	0	2070	3585	3740	0	22871	0	0	0	2070	3585	3740	0	21131	1740	1254248	1237632	32266	32266
Check Sums:																							

Current and Expected Cropping Pattern in Beba Irrigation District (2001)												Water Requirements (m^3/dy)												
Period	15	Area (Fed.)																						
		Existing pattern					Expected pattern																	
Canal No.	Name	Total	Barsed	Bt	Wheat	Vegel	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be	Wheat	Vegel	Gard	Cotton	Others	Ri	Maize	Fallow	Check Sums	
1	G. Ammar	8273	0	0	85	1039	998	0	4556	1555	0	0	0	85	1039	998	0	4596	1555	268939	264892	193485	193485	
2	Ammar Elkebla	5161	0	0	0	8	1255	580	0	2979	339	0	0	0	8	1255	580	0	2979	339	198703	198703	5161	5161
3	Ahmad Basla N.	4543	0	0	0	454	776	446	0	2867	0	0	0	454	776	446	0	2867	0	185138	176243	4543	4543	
4	Ahmad Basla S.	6349	0	0	0	201	406	770	0	4650	282	0	0	201	406	770	0	4690	282	244838	239716	6349	6349	
5	Eisharahna N.	4293	0	0	0	167	0	515	0	3531	80	0	0	167	0	515	0	3531	80	172557	166687	4293	4293	
6	Eisharahna S.	911	0	0	0	182	0	170	0	559	0	0	0	182	0	170	0	559	0	34556	32266	911	911	
7	Pumps	2468	0	0	0	972	0	143	0	1353	0	0	0	972	0	143	0	1353	0	95272	91395	2468	2468	
8	Abou Romh	268	0	0	0	1	0	23	0	244	0	0	0	1	0	23	0	244	0	10826	268	268	268	
Check Sums:		32266	0	0	0	2070	3476	3645	0	20819	2256	0	0	0	2070	3476	3645	0	20819	2256	1216615	1175438	32266	32266
Check Sums:																								

Current and Expected Cropping Pattern in Beba Irrigation District (2001)												Water Requirements (m^3/dy)												
Period	16	Area (Fed.)																						
		Existing pattern					Expected pattern																	
Canal No.	Name	Total	Barsed	Bt	Wheat	Vegel	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be	Wheat	Vegel	Gard	Cotton	Others	Ri	Maize	Fallow	Check Sums	
1	G. Ammar	8273	0	0	85	1039	998	0	4556	1555	0	0	0	85	0	998	0	3930	3260	264892	178185	8273	8273	
2	Ammar Elkebla	5161	0	0	8	1255	580	0	2979	339	0	0	0	8	0	580	0	2290	2283	193485	193447	5161	5161	
3	Ahmad Basla N.	4543	0	0	0	454	776	446	0	2867	0	0	0	454	0	446	0	2455	1188	128423	111713	4543	4543	
4	Ahmad Basla S.	6349	0	0	0	201	406	770	0	4650	282	0	0	201	0	770	0	4340	1038	239716	185578	6349	6349	
5	Eisharahna N.	4293	0	0	0	167	0	515	0	3531	80	0	0	167	0	515	0	3240	371	166687	139682	4293	4293	
6	Eisharahna S.	911	0	0	0	182	0	170	0	559	0	0	0	182	0	170	0	490	69	25750	911	911	911	
7	Pumps	2468	0	0	0	972	0	143	0	1353	0	0	0	972	0	143	0	930	423	91395	68721	2468	2468	
8	Abou Romh	268	0	0	0	1	0	23	0	244	0	0	0	1	0	23	0	170	74	10826	6754	268	268	
Check Sums:		32266	0	0	0	2070	3476	3645	0	20819	2256	0	0	0	2070	3476	3645	0	20819	2256	1175438	819828	32266	32266
Check Sums:																								

Table 6-4. (Continued).

Current and Expected Cropping Pattern in Beba Irrigation District (2001)																							
Period		17		Area (Fed.)		Water Requirements (m^3/dy)																	
No	Canal Name	Total	Barsed Bt	Wheat	Vegel	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be	Wheat	Veget	Gard	Cotton	Others	Ri	Maize	Fallow	Check Sums	
1	G. Ammar	8273	0	0	85	0	998	0	3430	3760	0	0	0	85	0	998	0	2430	4760	159411	91495	8273	
2	Ammar Elkebia	5161	0	0	8	0	580	0	2050	2483	0	0	0	8	0	580	0	1090	3483	95851	43526	5161	
3	Ahmad Basna N.	4543	0	0	454	0	446	0	2255	1388	0	0	0	454	0	446	0	2055	1588	104806	71968	4543	
4	Ahmad Basna S.	6349	0	0	0	0	201	0	770	0	4090	1288	0	0	0	201	0	770	0	3590	1788	176497	110465
5	Eisharahna N.	4293	0	0	0	0	167	0	515	0	3040	571	0	0	0	167	0	515	0	2040	1571	132277	73193
6	Eisharahna S.	911	0	0	0	0	182	0	170	0	470	89	0	0	0	182	0	170	0	370	189	25129	4293
7	Pumps	2468	0	0	0	0	972	0	145	0	1050	321	0	0	0	972	0	145	0	530	821	72406	46334
8	Abou Romh	268	0	0	0	0	1	0	43	0	160	64	0	0	0	1	0	43	0	110	114	6955	3574
Check Sums:		32266	0	0	0	0	2070	0	3667	0	16555	9964	0	0	0	2070	0	3667	0	12215	14314	773333	458067
Check Sums:																						32266	32266

Current and Expected Cropping Pattern in Beba Irrigation District (2001)																								
Period		18		Area (Fed.)		Water Requirements (m^3/dy)																		
No	Canal Name	Total	Barsed Bt	Wheat	Vegel	Gard	Cotton	Others	Ri	Maize	Fallow	Barsee	Be	Wheat	Veget	Gard	Cotton	Others	Ri	Maize	Fallow	Check Sums		
1	G. Ammar	8273	0	0	85	0	998	0	2230	4960	850	0	0	85	0	700	0	430	6208	86399	42245	8273		
2	Ammar Elkebia	5161	0	0	8	0	580	0	1290	3283	550	0	0	8	0	450	0	90	4063	48592	23361	5161		
3	Ahmad Basna N.	4543	0	0	454	0	446	0	1005	2638	450	0	0	454	0	350	0	55	3234	48493	30503	4543		
4	Ahmad Basna S.	6349	0	0	0	0	201	0	770	0	2880	2488	800	0	0	201	0	500	0	90	4758	53289	37618	6349
5	Eisharahna N.	4293	0	0	0	0	167	0	515	0	1290	2321	550	0	0	167	0	430	0	40	3106	26480	4293	4293
6	Eisharahna S.	911	0	0	0	0	182	0	170	0	220	339	75	0	0	182	0	150	0	70	434	10979	911	911
7	Pumps	2468	0	0	0	0	972	0	140	0	380	976	250	0	0	972	0	120	0	30	1096	42662	34608	2468
8	Abou Romh	268	0	0	0	0	1	0	41	0	75	151	25	0	0	1	0	38	0	10	194	2762	1578	268
Check Sums:		32266	0	0	0	0	2070	0	3660	0	9350	17156	3550	0	0	2070	0	2738	0	815	23093	390931	207372	
Check Sums:																						32266	32266	

Table 6-5: Crop water needs compared with water delivered to the Beba District expressed as daily average over each half-month period from March 2000 through September 2001 (See Sheet 1 of file “DEMO – Beba” on disk).

Per	From	To	Yr	Mo	Water Required		Delivered		Water Delivered		Expected		Fallow		Cropped		Dates		Water Delivered to Area					
					Existing	Expected	(million cubic meters/day)	% Diff. From Expected Need	Existing Need	% Diff. From Expected Need	Area fed	feddans	Fallow feddans	Cropped feddans	Per	From	To	Yr	Existing	Expected	m3/day feddan)	Water Required	Water Delivered to Area	
5	1 Mar	15 Mar	O	M	0.6264	0.7485	19.49	-4.24	2.34	-4.24	32266	1623	30643	895	31371	5	1 Mar	15 Mar	O	20.44	24.43			
6	16 Mar	31 Mar	O	A	0.6859	0.6995	0.6698	-2.34	0.24	-4.29	1623	1623	30643	895	31371	6	16 Mar	31 Mar	O	22.38	22.30	21.86	21.35	
7	1 Apr	15 Apr	O	A	0.7390	0.7740	0.7408	0.24	-6.16	-4.29	129	32137	52	32214	7	1 Apr	15 Apr	O	22.99	24.03	23.05	23.00		
8	16 Apr	30 Apr	N		0.7253	0.7253	0.6806	-6.16	56.84	-6.16	129	32137	129	32137	8	16 Apr	30 Apr	N	22.57	22.57	21.18	21.18		
9	1 May	15 May	M	M	0.4267	0.5348	0.8388	96.60	11525	11525	20741	7380	24886	9	1 May	15 May	N	20.57	21.49	40.44	33.71			
10	16 May	31 May	N	A	0.4574	0.3826	0.8453	84.82	12126	12126	20140	15023	17243	10	16 May	31 May	N	22.71	22.19	41.97	49.02			
11	1 Jun	15 Jun	J	J	0.8330	0.9033	1.0306	23.72	14.09	7954	24312	5062	27204	11	1 Jun	15 Jun	J	34.26	33.20	42.39	37.88			
12	16 Jun	30 Jun	O	J	0.9584	0.9855	0.7943	-19.40	-17.12	-19.40	940	31326	128	32138	12	16 Jun	30 Jun	O	30.60	30.66	25.36	24.72		
13	1 Jul	15 Jul	O	J	1.0281	1.0290	0.8192	-20.32	-20.39	-20.39	76	32190	52	32214	13	1 Jul	15 Jul	O	31.94	31.94	25.45	25.43		
14	16 July	31 July	O	J	1.1897	1.1884	0.8168	-31.35	-31.27	-31.35	0	32266	0	32266	14	16 Jul	31 Jul	O	36.87	36.83	25.31	25.31		
15	1 Aug	15 Aug	N	A	1.2942	1.2942	0.6908	-46.62	-46.62	-46.62	0	32266	0	32266	15	1 Aug	15 Aug	N	40.11	40.11	21.41	21.41		
16	16 Aug	31 Aug	S	A	1.2811	1.2811	0.9373	-26.84	-26.84	-26.84	0	32266	0	32266	16	16 Aug	31 Aug	S	39.71	39.71	29.05	29.05		
17	1 Sep	15 Sep	S	S	1.0933	1.1656	0.7726	-29.33	-33.72	-33.72	3206	28060	890	31376	17	1 Sep	15 Sep	S	37.62	37.15	26.59	24.62		
18	16 Sep	30 Sep	O	O	0.4281	0.5280	0.8144	90.23	54.26	17049	15217	12932	19334	18	1 Sep	30 Sep	O	28.13	28.13	53.52	42.12			
19	1 Oct	15 Oct	O	O	0.3683	0.3885	0.8247	123.93	112.27	13309	18957	12324	19492	19	1 Oct	15 Oct	O	19.43	19.48	43.50	41.36			
20	16 Oct	31 Oct	O	N	0.3975	0.3893	0.7408	86.37	90.29	9912	22354	21646	21 Oct	31 Oct	O	17.78	17.98	33.14	34.22					
21	1 Nov	15 Nov	O	N	0.3039	0.3246	0.6608	119.39	105.41	11683	20583	9627	22639	21	1 Nov	15 Nov	O	14.77	14.34	32.40	27.23			
22	16 Nov	30 Nov	O	O	0.3328	0.3499	0.6809	104.50	94.52	8493	23773	7273	24963	22	16 Nov	30 Nov	O	14.00	14.00	28.63	27.23			
23	1 Dec	15 Dec	O	D	0.4517	0.4517	0.5358	18.62	18.62	0	32266	0	32266	23	1 Dec	15 Dec	O	14.00	14.00	16.61	16.61			
24	16 Dec	31 Dec	O	C	0.4235	0.4517	0.5973	41.04	32.23	0	32266	0	32266	24	16 Dec	31 Dec	C	13.12	14.00	18.51	18.51			
25	1 Jan	15 Jan	J	J	0.4517	0.4517	0.5638	-24.81	-24.81	-24.81	0	32266	0	32266	25	1 Jan	15 Jan	J	14.00	14.00	17.47	17.47		
26	16 Jan	31 Jan	O	O	0.4235	0.4517	0.1477	-65.13	-67.31	-65.13	0	32266	0	32266	26	16 Jan	31 Jan	O	13.12	14.00	4.58	4.58		
27	1 Feb	15 Feb	O	F	0.4294	0.4689	0.6755	57.30	43.76	3500	28766	0	32266	27	1 Feb	15 Feb	O	14.93	14.56	23.48	20.94			
28	16 Feb	28 Feb	N	N	0.5092	0.4977	0.7557	48.41	51.84	3500	28766	3500	28766	28	1 Feb	28 Feb	N	17.70	17.30	26.27	26.27			
29	1 Mar	15 Mar	M	M	0.5896	0.5884	0.6636	12.56	12.79	3705	28561	3500	28766	29	1 Mar	15 Mar	M	20.64	20.45	23.24	23.07			
30	16 Mar	31 Mar	M	M	0.6618	0.7103	0.5582	-15.64	-21.41	-21.41	3044	29222	661	31605	6	16 Mar	31 Mar	M	22.65	22.47	19.10	17.66		
31	1 Apr	15 Apr	A	A	0.9696	0.9694	0.6201	-36.05	-36.03	-36.03	0	32266	0	32266	7	1 Apr	15 Apr	A	30.05	30.04	19.22	19.22		
32	16 Apr	30 Apr	A	A	0.5429	0.9804	0.6611	21.78	-32.57	-32.57	12565	19701	0	32266	8	16 Apr	30 Apr	A	27.56	30.38	33.56	20.49		
33	1 May	15 May	M	M	0.5189	0.5599	0.7521	44.94	34.33	14351	17912	19142	9	1 May	15 May	M	28.96	29.25	41.98	39.29				
34	16 May	31 May	J	J	0.5129	0.5529	0.7600	48.18	37.46	14871	17395	13570	18696	10	16 May	31 May	J	29.48	29.57	43.69	40.65			
35	1 Jun	15 Jun	J	J	1.0664	0.6118	0.7923	-25.71	29.50	0	32266	13625	18641	11	1 Jun	15 Jun	J	33.05	32.82	24.56	42.50			
36	16 Jun	30 Jun	O	O	0.9837	0.9249	0.8481	-13.78	-8.30	433	31833	2188	30078	12	16 Jun	30 Jun	O	30.90	30.75	26.64	28.20			
37	1 Jul	15 Jul	O	J	1.1314	1.1179	0.8056	-28.79	-27.93	-27.93	0	32266	390	31876	13	1 Jul	15 Jul	O	35.07	35.07	24.97	25.27		
38	16 Jul	31 Jul	N	A	1.2542	1.2539	0.8396	-33.04	-33.04	-33.04	0	32266	0	32266	14	16 Jul	31 Jul	Z	38.87	38.86	26.02	26.02		
39	1 Aug	15 Aug	A	A	1.2166	1.2376	1.0217	-16.02	-17.45	-17.45	2256	30010	1740	30526	15	1 Aug	15 Aug	A	40.54	40.54	34.05	33.47		
40	16 Aug	31 Aug	A	A	1.1754	1.1754	1.0072	-14.31	-14.31	-14.31	2256	30010	16	16 Aug	31 Aug	A	39.17	39.17	33.56	33.56				
41	1 Sep	15 Sep	S	S	0.7733	0.8198	0.9746	26.03	18.88	18.88	9964	22302	8706	23560	17	1 Sep	15 Sep	S	34.68	34.80	43.70	41.37		
42	16 Sep	30 Sep	O	O	0.3909	0.4581	0.8631	120.77	88.41	17156	15110	14314	17932	18	16 Sep	30 Sep	O	25.87	25.52	57.12	48.08			
43	1 Oct	15 Oct	O	O	0.2074	0.2074	0.2074	0	23093	9173	19	1 Oct	15 Oct	O	22.61	22.61								

The data values for area in fallow for the existing and expected time periods follow in a similar fashion. For example, for period 5, 2000, Table 6-4, the existing area of fallow totals 1623 feddans for the district. This value is entered into Table 6-5 for the time period, 16 Mar – 31 Mar. The expected area of fallow (period 5, 2000, Table 6-4) is 895 feddans. This is the area expected to be in fallow during the next half-month time period, and thus the value 895 feddans is entered into Table 6-5 as expected fallow for 1 Apr – 15 Apr, 2000.

Table 6-6 shows daily water delivered to the pilot district and daily average over each half-month period expressed as million m³. This table is summarized from results of the water-monitoring program presented in Chapter 9. This table (Table 6-6) forms the far right part of Sheet 1 of Beba DEMO spreadsheet. Proper daily values from the results of the water-monitoring program (Chapter 9) must be entered into this area of Beba DEMO.

In summary, Beba DEMO requires five types of data to be entered for each half-month: (1) crop water needs (million m³/day) for existing crops, (2) crop water needs (million m³/day) for expected crops, (3) existing area (feddans) of fallow, (4) expected area (feddans) of fallow, and daily values of water delivered (million m³) to the district.

Figures 6-1 and 6-2 show the water delivered to the district compared to the calculated water needs – average daily values for the half-month time period expressed in million m³/day. The curve labeled “existing” need shows the water needed by the existing or current crops for the particular half month. The “expected” need for the particular half month is the water needed by the crops calculated from cropping patterns that were forecast from the previous half-month.

Figures 6-3 and 6-4 give the same information expressed on a per feddan (of cropped area) basis. Since the existing and expected areas of crops do not agree exactly, two curves of water delivery are calculated. The first labeled “Delivered/(Existing Area)” is the water delivered in m³/day per feddan of existing crops. The second labeled “Delivered/(Expected Area)” is the water delivered in m³/day per feddan of crops forecast during the previous half-month as expected for the given half-month.

Another pair of figures (Figures 6-5 and 6-6) plot the percent difference of water delivered from existing need and from expected need (See Report 45, section 3.5.2 for equations). Positive values of percent difference mean over-delivery and negative values designate under-delivery.

Figure 6-7 combines the information of Figures 6-1 and 6-2 for the entire time data was collected, *i.e.*, from March 2000 through September 2001. Likewise, Figures 6-8 and 6-9 combine Figures 6-3 and 6-4, and 6-5 and 6-6, respectively.

Table 6-6. Daily water delivered to the Beba District and daily average over each half-month period from March 2000 through September 2001 expressed as million m³ (See Sheet 1 of file “DEMO – Beba” on disk).

Day	2000											2001							
	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
1	0.246	0.819	1.025	1.116	0.835	0.000	0.481	0.531	0.706	0.343	1.239	0.531	0.580	0.451	0.000	0.000	0.565	1.002	1.842
2	0.238	0.833	1.019	1.069	0.000	0.642	0.556	0.503	0.374	0.438	0.646	0.645	0.449	0.694	0.235	0.000	0.529	1.848	2.234
3	0.234	0.875	0.999	1.074	0.622	0.662	0.551	0.546	0.776	0.666	0.129	0.947	0.663	1.166	1.213	0.000	0.984	1.766	1.580
4	0.323	0.000	0.581	1.169	0.635	0.662	0.834	0.864	1.430	1.227	0.453	0.992	1.212	1.074	1.482	0.344	0.839	1.614	0.948
5	0.240	0.000	0.596	1.082	0.637	0.662	1.397	1.498	1.008	1.048	0.317	0.936	1.236	1.165	1.423	1.388	0.891	0.946	0.896
6	0.000	0.000	0.495	0.609	1.394	0.918	0.965	0.980	0.874	0.077	1.136	1.203	0.628	1.385	1.370	0.961	0.759	0.853	
7	0.000	0.069	0.000	0.306	1.482	0.918	1.008	0.979	0.923	0.475	0.641	0.400	0.886	0.656	1.364	1.349	0.708	0.365	0.531
8	0.504	0.964	0.998	0.372	1.078	0.944	1.075	1.013	0.323	0.628	1.532	0.478	0.785	0.701	1.107	1.357	0.561	0.488	0.578
9	1.133	1.214	0.945	0.363	1.045	0.816	0.945	0.867	0.307	0.232	1.032	0.780	0.336	0.734	0.832	1.185	0.972	0.587	0.992
10	1.138	1.167	0.956	1.288	1.035	0.272	0.511	0.732	0.218	0.176	1.170	0.800	0.245	0.754	0.855	0.206	1.124	1.147	0.914
11	1.700	1.280	1.233	1.564	0.899	0.290	0.734	0.934	0.236	0.193	0.716	0.718	0.274	0.752	0.760	0.915	1.095	1.210	0.519
12	1.727	1.274	1.578	1.527	0.405	0.769	0.740	0.763	0.644	0.763	0.507	0.343	0.404	0.526	0.624	0.942	0.991	1.181	0.475
13	1.651	0.471	0.973	1.515	1.011	0.777	0.771	0.857	0.716	0.454	0.000	0.378	0.486	0.000	0.000	0.998	0.679	1.018	0.690
14	1.126	1.002	0.823	1.566	0.995	0.777	0.750	0.842	0.682	0.255	0.000	0.522	0.733	0.000	0.000	0.894	0.603	0.633	0.706
15	0.966	1.145	0.855	0.952	1.000	0.777	0.318	0.478	0.680	0.266	0.000	0.527	0.462	0.000	0.000	0.937	0.584	0.763	0.861
Average	0.7485	0.7408	0.8388	1.0306	0.8192	0.6908	0.7726	0.8247	0.6668	0.5358	0.5638	0.6755	0.6636	0.6201	0.7521	0.7923	0.8056	1.0217	0.9746
16	0.463	1.138	1.074	0.000	0.916	1.162	0.571	0.531	0.627	0.265	0.000	0.826	0.525	0.000	0.000	0.769	0.603	0.982	1.607
17	0.446	0.933	1.062	0.609	0.406	0.684	0.252	0.513	0.486	0.467	0.000	1.556	0.430	0.436	0.204	0.000	0.670	1.809	1.542
18	0.429	0.981	0.573	0.637	0.609	0.684	0.508	0.559	0.577	0.599	0.000	1.304	0.660	1.116	1.284	0.000	0.797	1.766	1.425
19	0.446	0.536	0.607	0.637	0.614	0.684	1.093	0.696	0.871	1.182	0.000	0.857	0.644	1.028	1.331	0.113	0.868	1.577	0.951
20	0.000	0.598	0.632	0.627	0.684	1.526	1.200	1.171	1.238	0.000	0.866	1.070	1.274	1.443	0.580	0.844	1.006	0.816	
21	0.000	0.532	0.628	0.629	0.902	1.114	1.126	1.380	1.152	0.000	0.764	1.134	1.350	1.459	0.921	0.878	0.883	0.497	
22	0.000	0.000	0.934	1.298	1.025	1.161	1.100	0.921	0.735	0.000	0.411	1.190	1.163	1.312	1.013	0.715	0.621	0.492	
23	0.000	0.401	1.056	1.091	0.806	1.125	1.102	0.995	0.870	0.710	0.000	0.547	0.846	0.547	0.390	1.542	0.625	0.585	0.579
24	0.701	0.699	1.002	1.071	1.003	1.114	1.092	0.957	0.902	0.472	0.000	0.588	0.824	0.851	0.925	1.380	1.063	0.580	1.258
25	0.996	0.650	1.312	1.074	0.956	1.367	0.568	0.653	0.702	0.446	0.000	0.738	0.619	0.838	0.886	1.249	1.011	1.079	0.885
26	1.005	1.091	1.343	0.881	0.771	1.430	0.778	0.806	0.347	0.516	0.000	0.691	0.252	0.770	0.865	1.131	1.027	1.120	0.358
27	1.020	1.115	1.220	0.960	0.866	0.718	0.763	0.579	0.674	0.323	0.000	0.343	0.286	0.790	0.894	1.253	1.214	0.979	0.434
28	1.533	0.745	0.688	0.923	0.896	1.174	0.794	0.677	0.630	0.326	0.513	0.341	0.232	0.444	0.810	0.999	1.015	0.680	0.451
29	1.247	0.418	0.812	0.822	0.898	0.994	0.807	0.758	0.361	0.378	0.808	0.237	0.000	0.297	1.021	0.560	0.659	0.475	
30	0.897	0.822	0.817	0.849	0.876	0.863	0.347	0.390	0.704	0.747	0.000	0.000	0.000	0.000	0.000	0.825	0.741	0.658	0.810
31	0.863	0.515	0.825	0.710	0.352	0.327	1.443	0.695	0.116	0.000	0.000	0.000	0.000	0.000	0.644	0.903	0.903	0.8387	
Average	0.6279	0.6353	0.8257	0.7832	0.8050	0.9351	0.8344	0.7390	0.7273	0.6688	0.1726	0.5666	0.7070	0.7561	0.8530	0.8297	0.9930	0.9930	0.8387

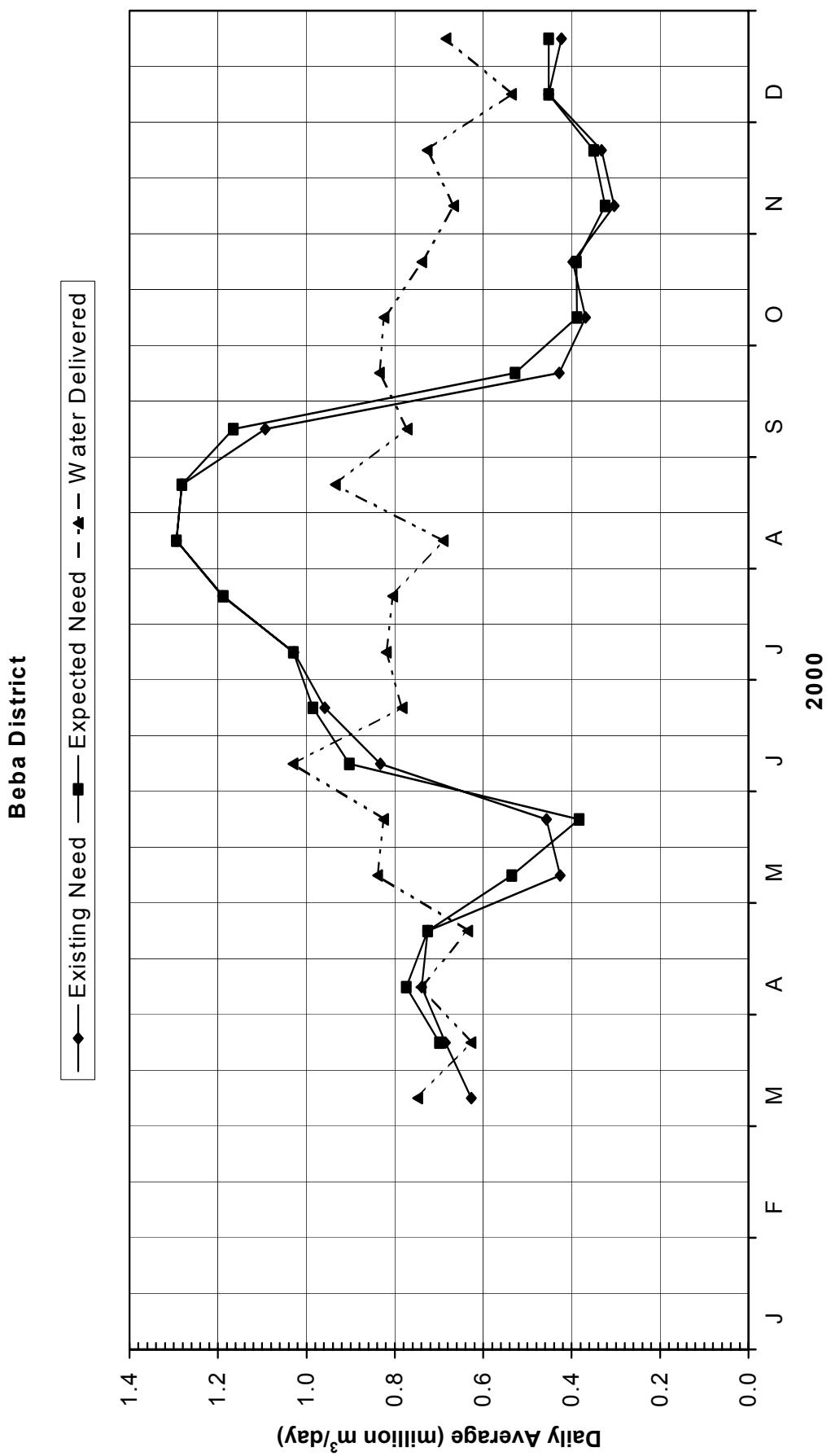


Figure 6-1. Daily crop water needs and water delivered to the Beba District averaged over each half-month period and expressed as million m³/day in 2000 (See Chart 1 of file "DEMO - Beba" on disk).

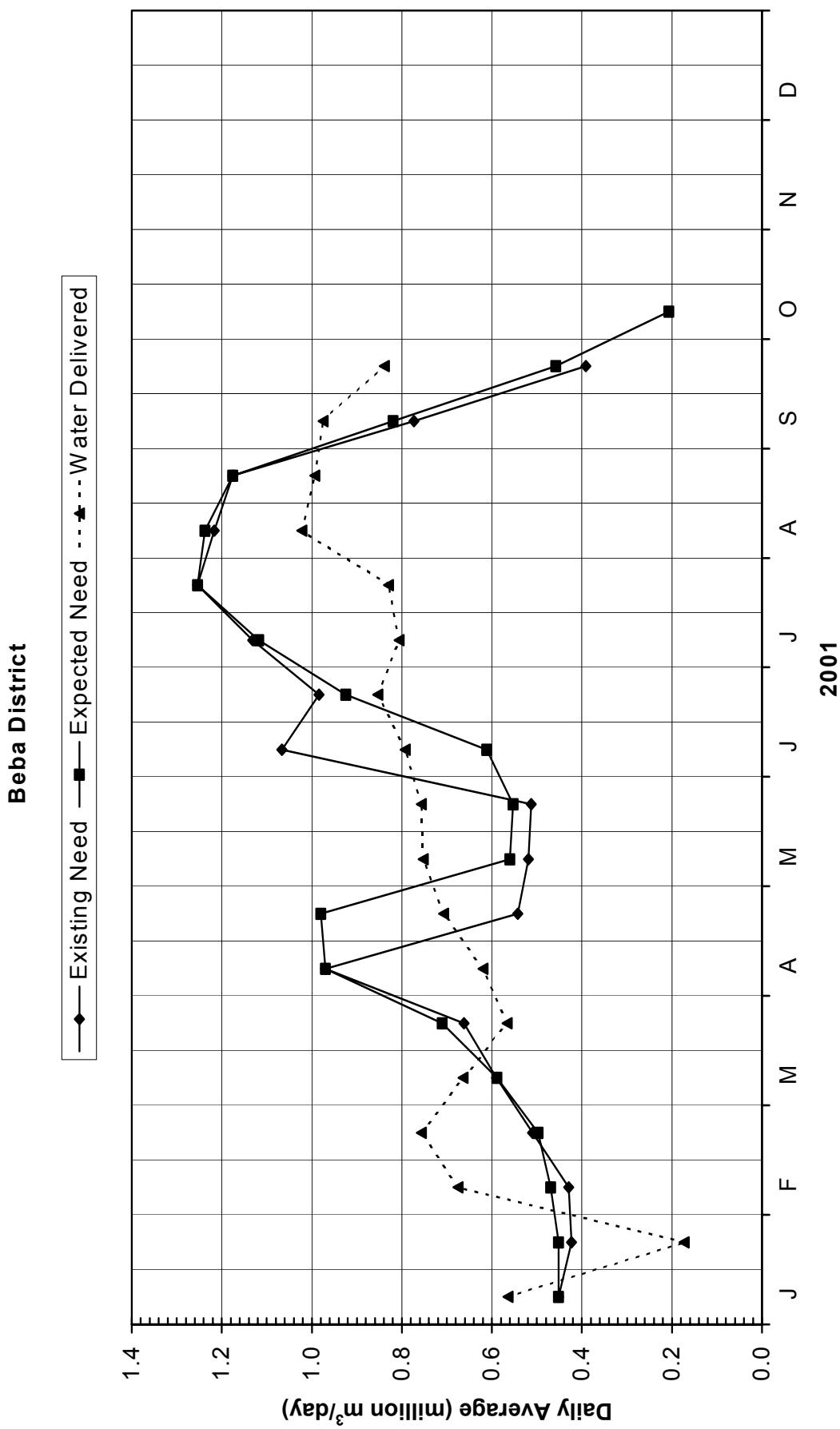


Figure 6-2. Daily crop water needs and water delivered to the Beba District averaged over each half-month period and expressed as million m^3/day in 2001 (See Chart 2 of file "DEMO - Beba" on disk).

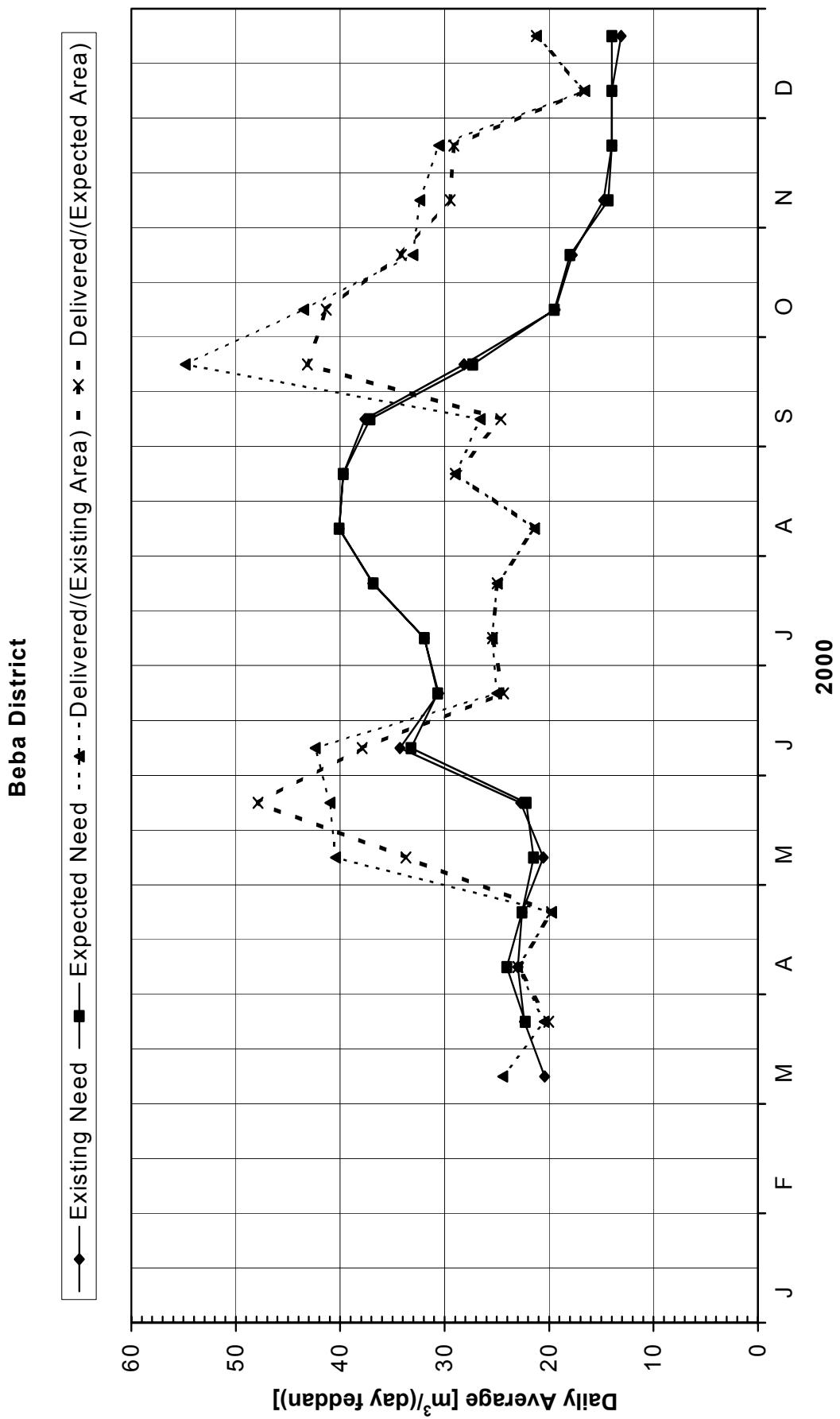


Figure 6-3. Daily crop water needs and water delivered to the Beba District averaged over each half-month period and expressed as m³/day per feddan of crop area in 2000 (See Chart 11 of file "DEMO - Beba" on disk).

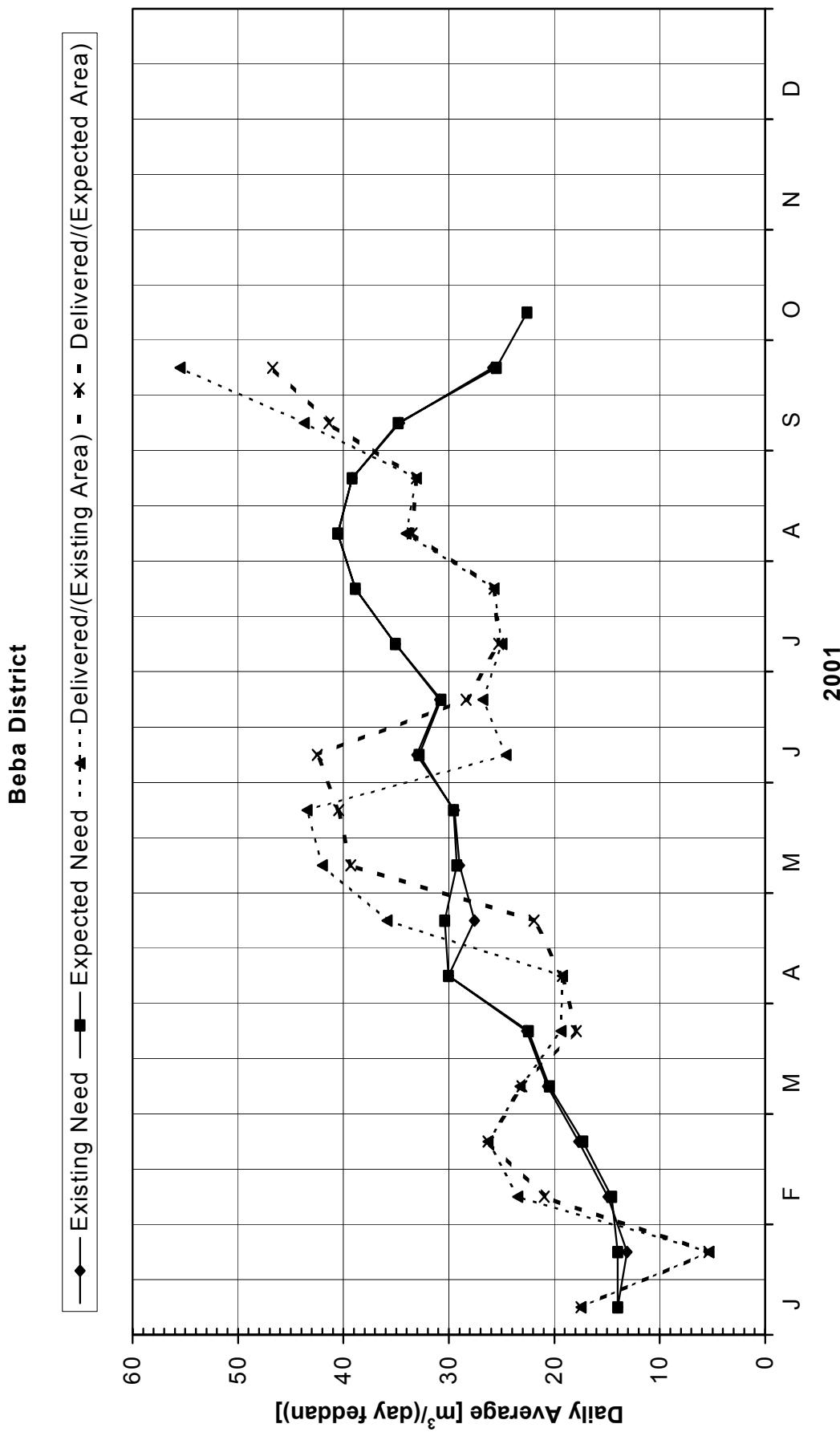


Figure 6-4. Daily crop water needs and water delivered to the Beba District averaged over each half-month period and expressed as m^3/day per feddan of crop area in 2001 (See Chart 12 of file "DEMO - Beba" on disk).

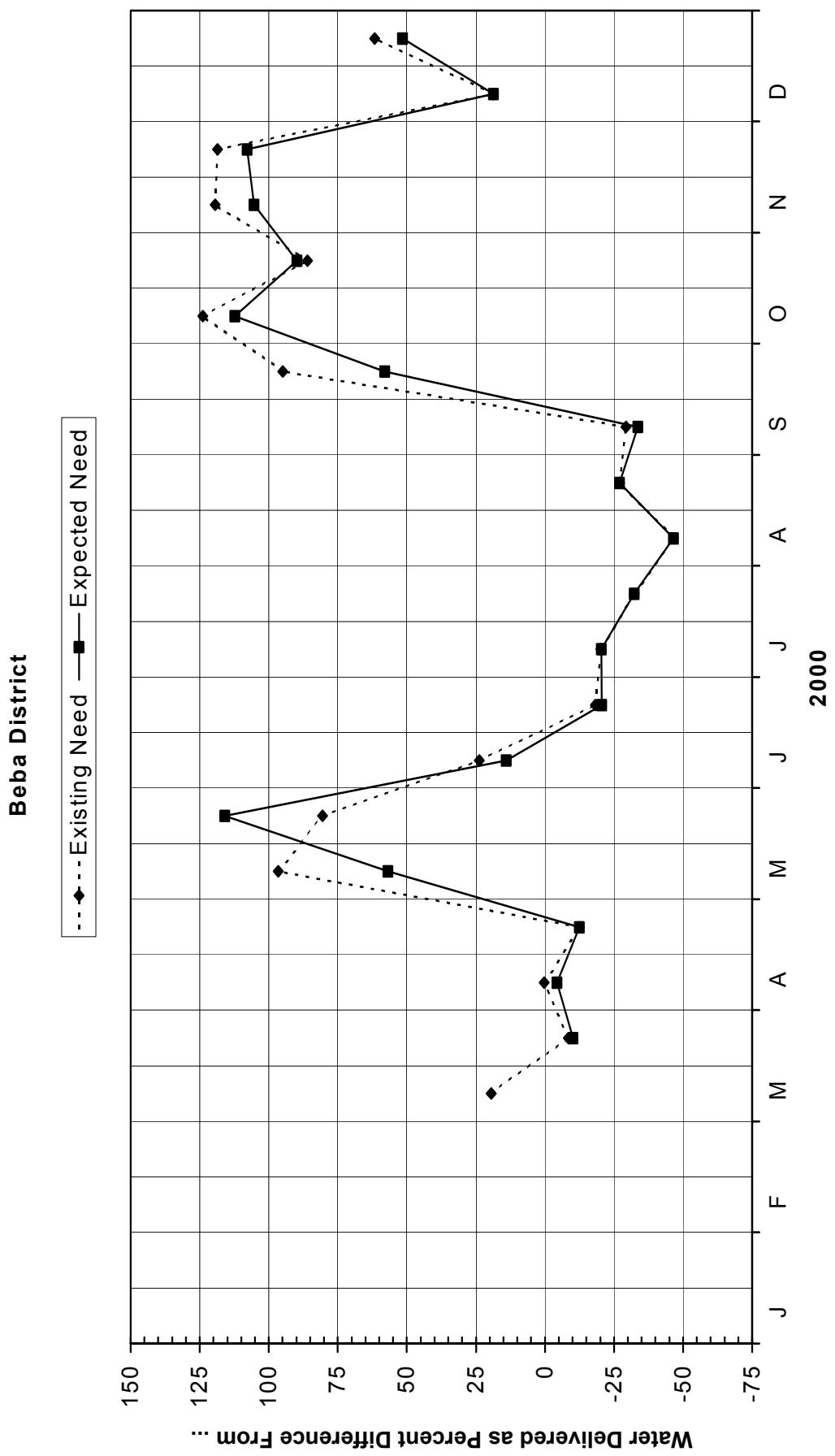


Figure 6-5. Percent difference of daily water delivered from crop water needs of existing crops and expected crops in the Beba District averaged over each half-month period in 2000 (See Chart 21 of file "DEMO - Beba" on disk).

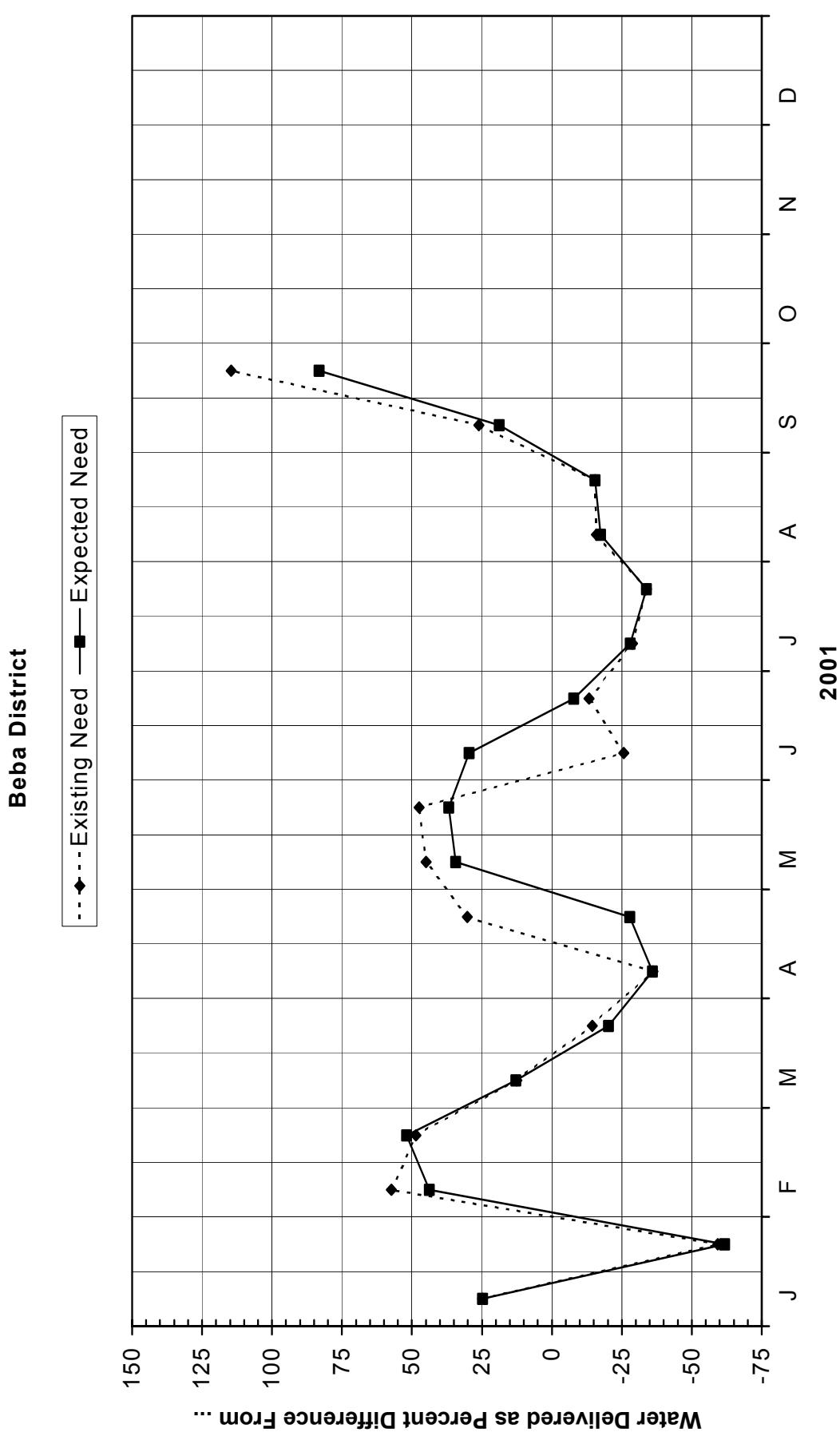


Figure 6-6. Percent difference of daily water delivered from crop water needs of existing crops and expected crops in the Beba District averaged over each half-month period in 2001 (See Chart 22 of file "DEMO – Beba" on disk).

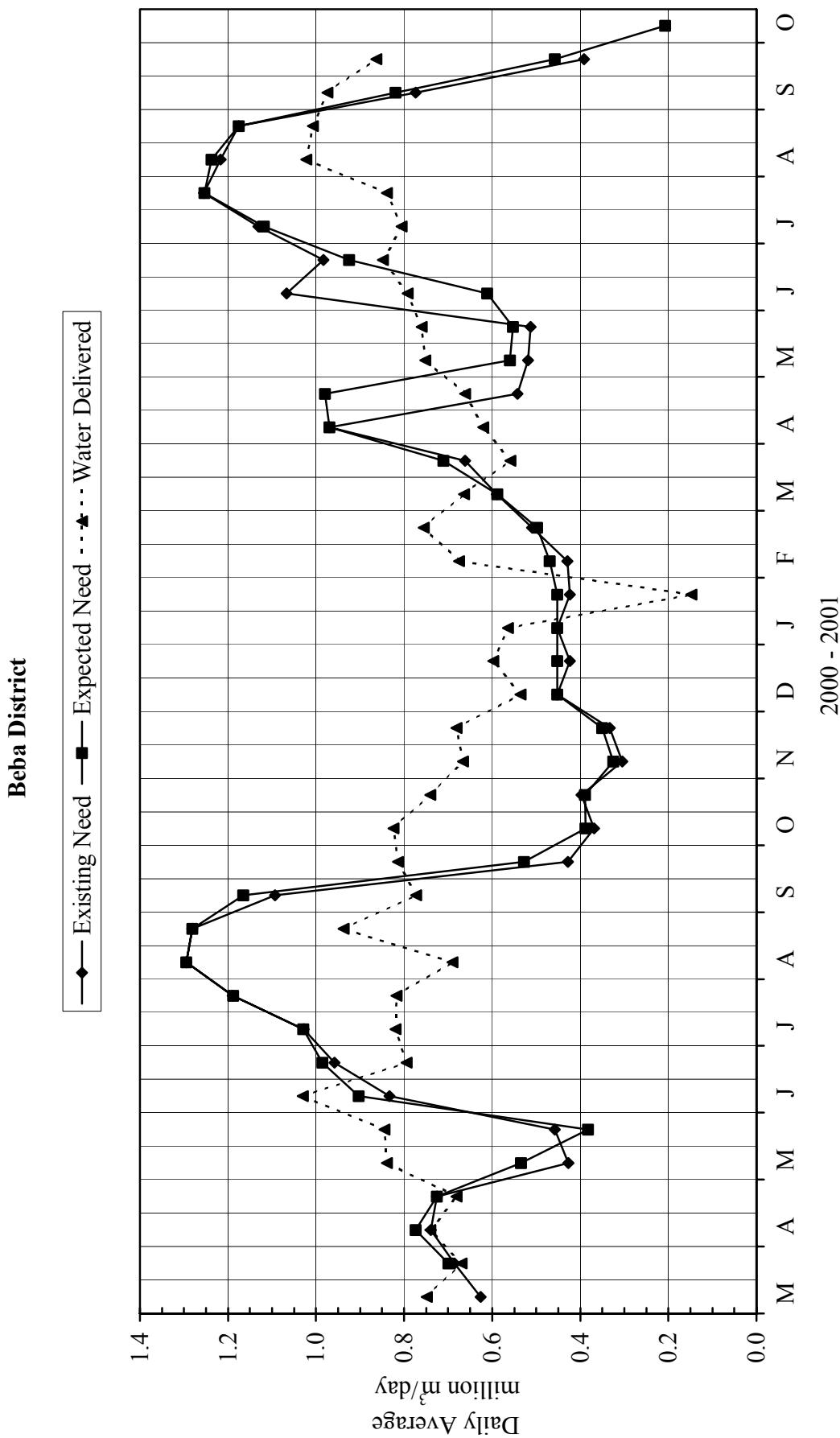


Figure 6-7. Daily crop water needs and water delivered to the Beba District averaged over each half-month period and expressed as million m^3 /day from March 1, 2000 through October 15, 2001.

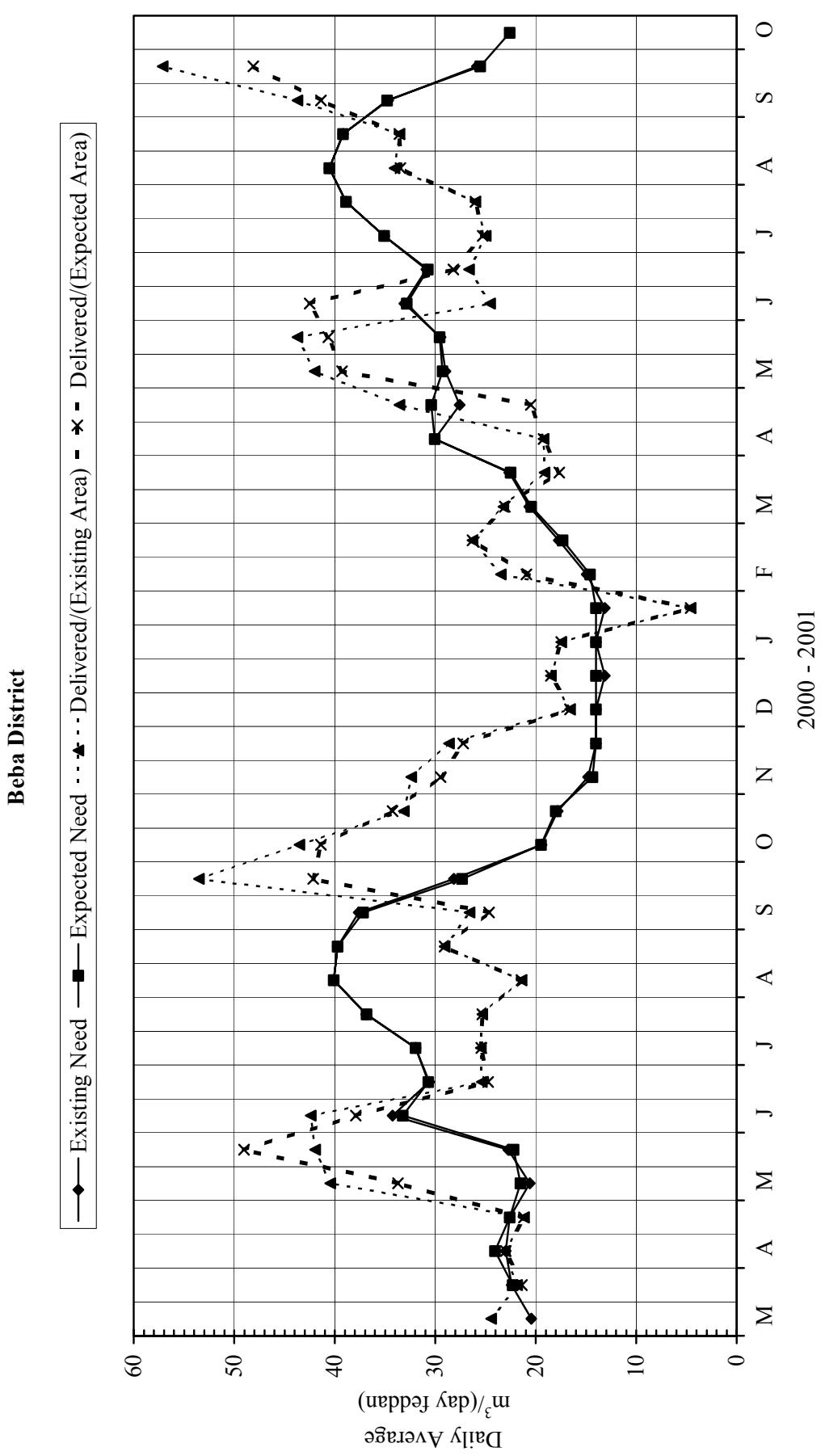


Figure 6-8. Daily crop water needs and water delivered to the Beba District averaged over each half-month period and expressed as m^3/day per feddan of crop area from March 1, 2000 through October 15, 2001.

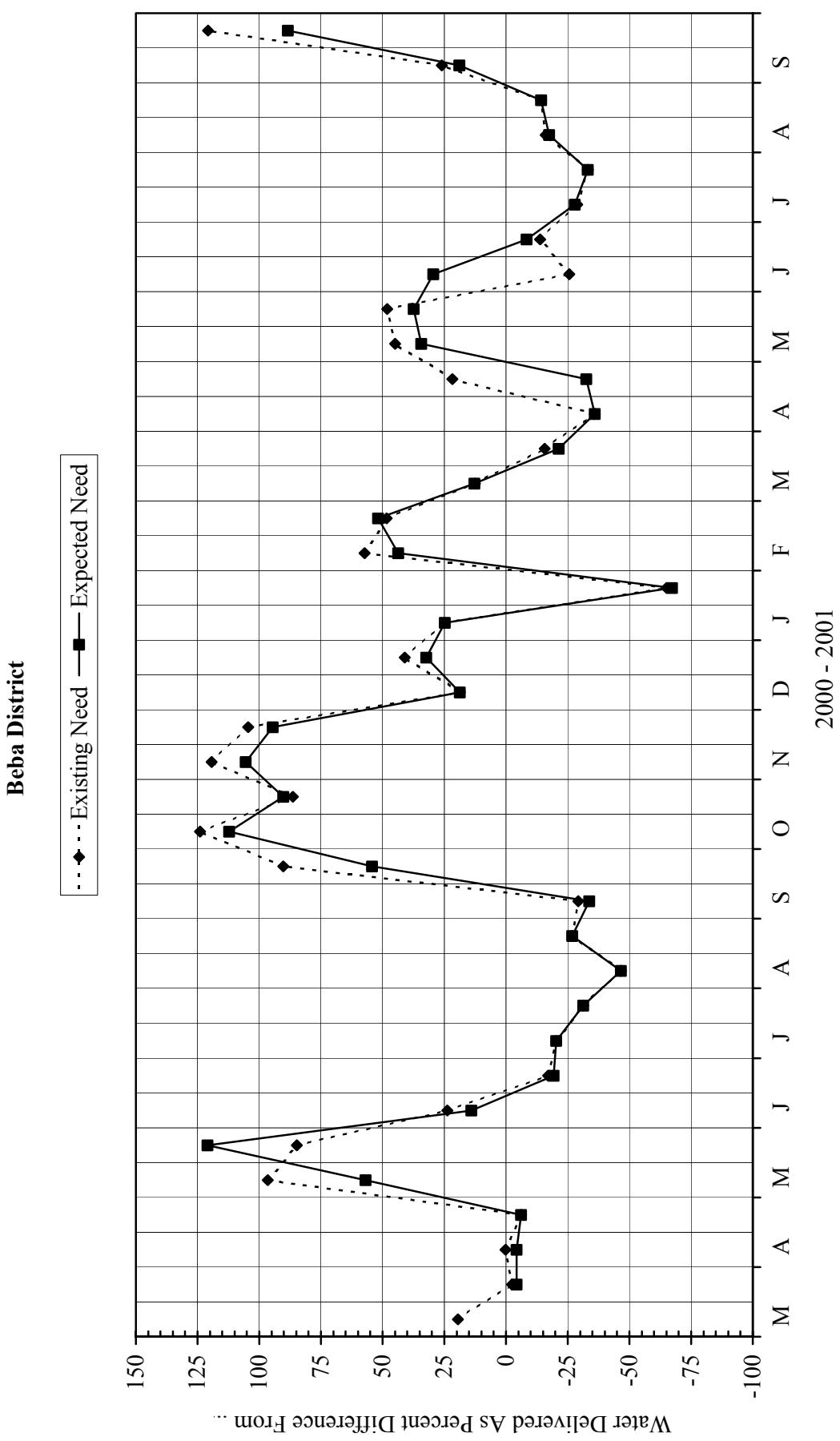


Figure 6-9. Percent difference of daily water delivered from crop water needs of existing crops and expected crops in the Beba District averaged over each half-month period from March 2000 through September 2001.

7 Crop Water Needs Microsoft Access User's Manual

7.1 Introduction

This chapter presents a user's manual for the Microsoft Access tool for estimating actual (current or existing) and expected crop water needs at the district level. This is Version II of the Microsoft Excel tool described in Chapters 4, 5, and 6, and uses the same fundamental equations and approach to calculation of crop water needs. On a semi-monthly basis, the Ministry of Agriculture and Land Reclamation (**MALR**) has developed an Access tool for aggregating crop areas from the hood up to the canal level within the agricultural administrative unit or units within the irrigation district. The output of this tool is communicated to the irrigation district of the Ministry of Water Resources and Irrigation (**MWRI**). The district then calculates the canal water needs based on the submitted cropping pattern and, in turn, submits these needs to the general irrigation directorate, which again communicates water needs reports to upper levels of water distribution of **MWRI**. Activities required by **MWRI** includes entering semi-monthly cropping pattern data, calculating water needs for canals serving the districts, generating reports/graphical data presentations, and finally sending these reports to the general directorates via e-mail.

The objective of developing the Access tool is to provide **MWRI** district engineers with an automated, user friendly, and practical tool for implementing the national MISD policy in their districts.

Chapters 4, 5, and 6 of this report present the Crop Water Needs model and user's manual for the Excel version. In this chapter, the user's manual for the Access version is presented. Chapter 8 is devoted to presentation of examples of results and calculations from the Access version. It is not intended in these two chapters to present the technical model for calculating water needs, however, the user is advised to refer to the Excel version guide whenever it is required to understand the model's specific theory and relevant equations (See also APRP Water Policy Program Report 45, December 2001).

7.2 Background

The water needs tool is developed using the Microsoft Access database programming language. This is one of the Microsoft Office programs used in developing integrated, relational databases. The Access tool is developed under Arabic Windows 2000 and utilizing Microsoft Office 2000. The Access development tool uses Visual Basic coding language and SQL database query language. The main feature of Access is that it is a visual programming language, a language fully compatible with the Microsoft Windows environment. This feature provides a powerful tool for the programmer whose intention is to tailor a flexible user interface for a specific model.

All objects (main screens/forms, menus/sub-menus, text and graphical reports) developed for the water needs model are designed to display in the English language. However, in further developments of this tool, those objects can easily be translated to display in Arabic. It is to be noted that, since this version is developed under the Arabic Windows environment, there is no problem in using Arabic numerals of the operating system. In this case report headings, Access objects will still appear in English, while numbers will display and print in Arabic.

7.3 Software Requirements and Installation

7.3.1 Software Requirements

The program is developed using Microsoft Access 2000, therefore it should be installed under Arabic Windows 98/2000/NT operating system and Microsoft Office 2000. It is recommended that Microsoft Outlook be installed on the computer running this tool. The program can be installed on any PC configuration that runs both Microsoft Windows and Office 2000 without memory problems.

Applications developed with Access have the extension “.mdb” in the development phase. Until the beta version of this tool is verified, the program should be run with Microsoft Access installed on the district’s computer. When this version is completely tested it can be transformed to “.mde” file where the user, or even the system manager, can not change the design of the interface and data base objects. The crop water needs tool can then be transformed to a “.exe” file which runs independent of Microsoft Access.

The program is distributed on 1 floppy disk (**Disk 2 attached to this report**) that contains the following files:

- 1- MISD_Tool.zip, a compressed file of the water need Access application.
- 2- Winzip32.exe file, this is the program that will be used to extracts the .mdb file.

7.3.2 Installation

To install the program, the user should follow the following procedure:

1. Copy all files to the application folder on the MISD computers of the irrigation districts. In order to have a standard file structure for MISD computers, it is advised that the folder should be created under a main directory named MISD and be given the name application. All files therefore, will be located in the directory named “\MISD\application”.
2. Click on winzip.exe icon to run the unzip program and ask it to extract the water needs program from the MISD-Tool .zip file and put it on the folder named MISD\ application.
3. Once the MISD-Tool.zip file is decompressed an icon having the name “MISD-Tool.mdb” will display in the same folder. This is the water needs access tool which shall be used later to analyze MISD data. MISD-tool.mdb contains database tables, water requirement model and reports required to accomplish all MISD activities.
4. Install Microsoft Outlook on the computer running this tool.
5. Configure/add the district’s e-mail account on Microsoft Outlook.

7.4 District Configuration

7.4.1 Data Types

There are two types of data relevant to this tool. First, “static data” describe and configure the district’s specific system. Static data define the district canal system and include an exhaustive list of the crops to be cultivated in the district throughout the year together with the other crop related definitions. Weather data are also considered as static data since they

should be updated every few years whenever an update of the average monthly (or semi-monthly) rainfall in the district is available.

The second data type is the so called “dynamic data”, these include historic current/expected cropping pattern data entered through the user interface to the data base, the current /expected water needs data calculated based on both current and expected historic crop pattern data, respectively. Here, the semi-monthly crop pattern data of all district canals are considered as dynamic data. These are the semi-monthly data submitted by the **MALR** administrative unit to district engineers twice each month.

7.4.2 Operation Modes

There are two modes for running this application, the first is the system manager’s mode, while the second is the user’s mode. Until the system is completely tested, the model will be run in the user’s mode. In this mode, the user is not permitted to deal with static data. Instead, he can edit dynamic data through the Access user interface developed for this purpose. It is therefore recommended that the first installation and configuration of this tool in any given irrigation district be supervised by engineers of **MWRI** properly trained in the Access version of the crop water needs calculation tool.

7.5 User Interface

The user interface of the water needs Access tool allows the user to accomplish all MISD relevant activities in a user friendly way. Besides, it contains some quality control features that provide the user with validation checks on cropped areas for each canal in the district. In the following few paragraphs, the user is presented with the set of menus and screens developed in this tool.

7.5.1 Main Menu and Welcome Screen

Once the user clicks the icon named “MISD_tool.mdb”, a welcome screen displays for a few seconds, this screen contains information about the program license, and technical support contact information. Figure 7-1 shows the welcome screen and the main menu bar of the water needs tool. The menu bar on the top of the screen, contains some built in office items, and items specific to the **MISD** tool.

The built in items are namely the File, Edit, Tools, Windows, and Help items. Those are common tools of Microsoft Office, and will be used in further development of the system. They can also be utilized by the user to issue Windows- and Office-common commands and operations. This screen displays for few seconds to be followed by another window (Access form) that shows the **MISD** procedure that should be followed in order to fully utilize this tool. Figure 7-2 is a snapshot of the procedure form. Each activity in this procedure form has a corresponding menu/pop-up menu item in the user interface of the water needs tool.

7.5.2 Data Entry, Main Menu Item

Through this menu item, the user can accomplish all required data entry operations. Once the user click on the main menu “Data Entry” item, a popup menu displays showing only one choice. That is to display data entry main form. Figure 7-3 shows the main menu bar and the popup menu of the “Data Entry” menu item. When choosing this item, an Access form is

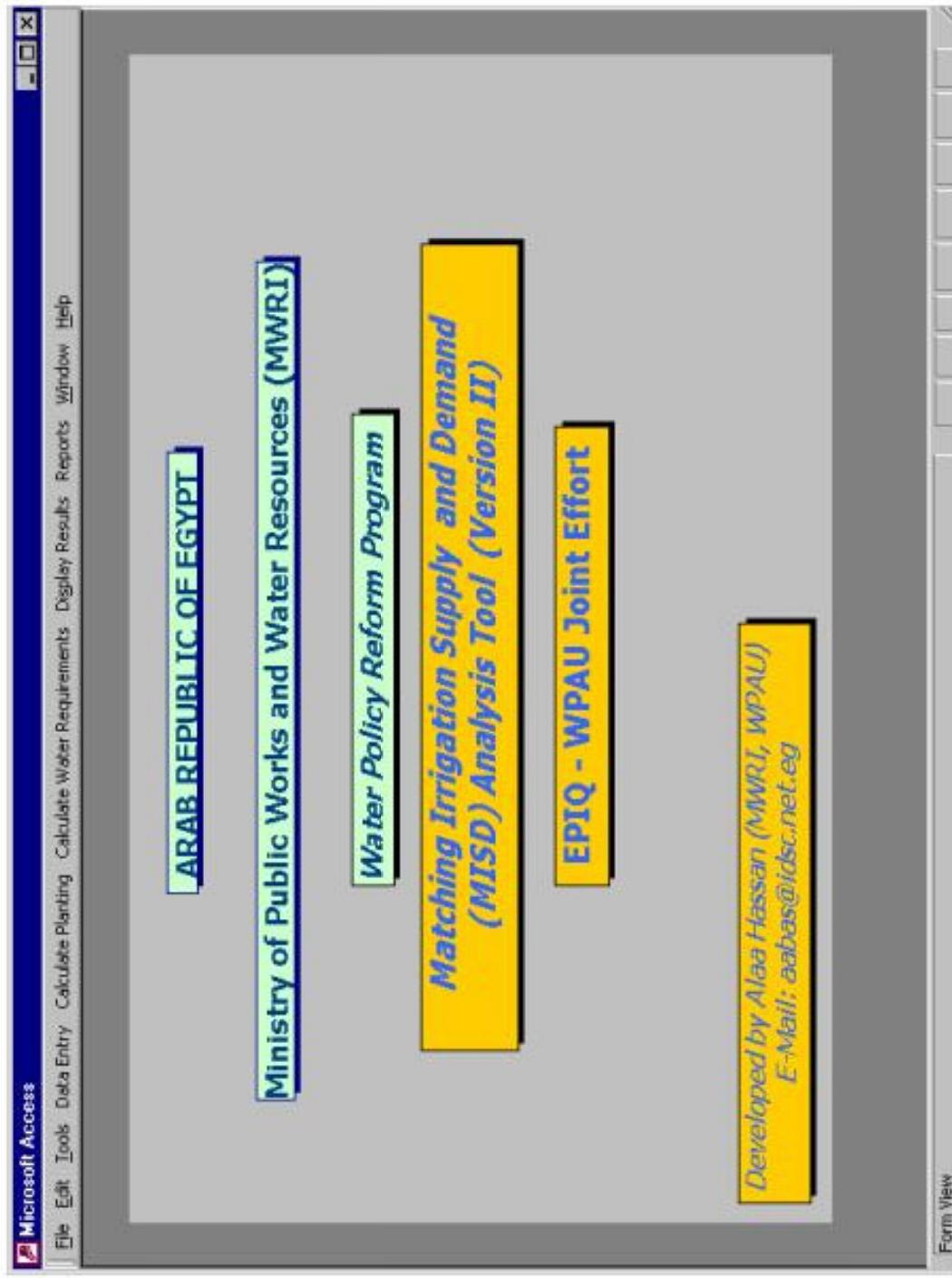


Figure 7-1. Crop water needs tool welcome screen.

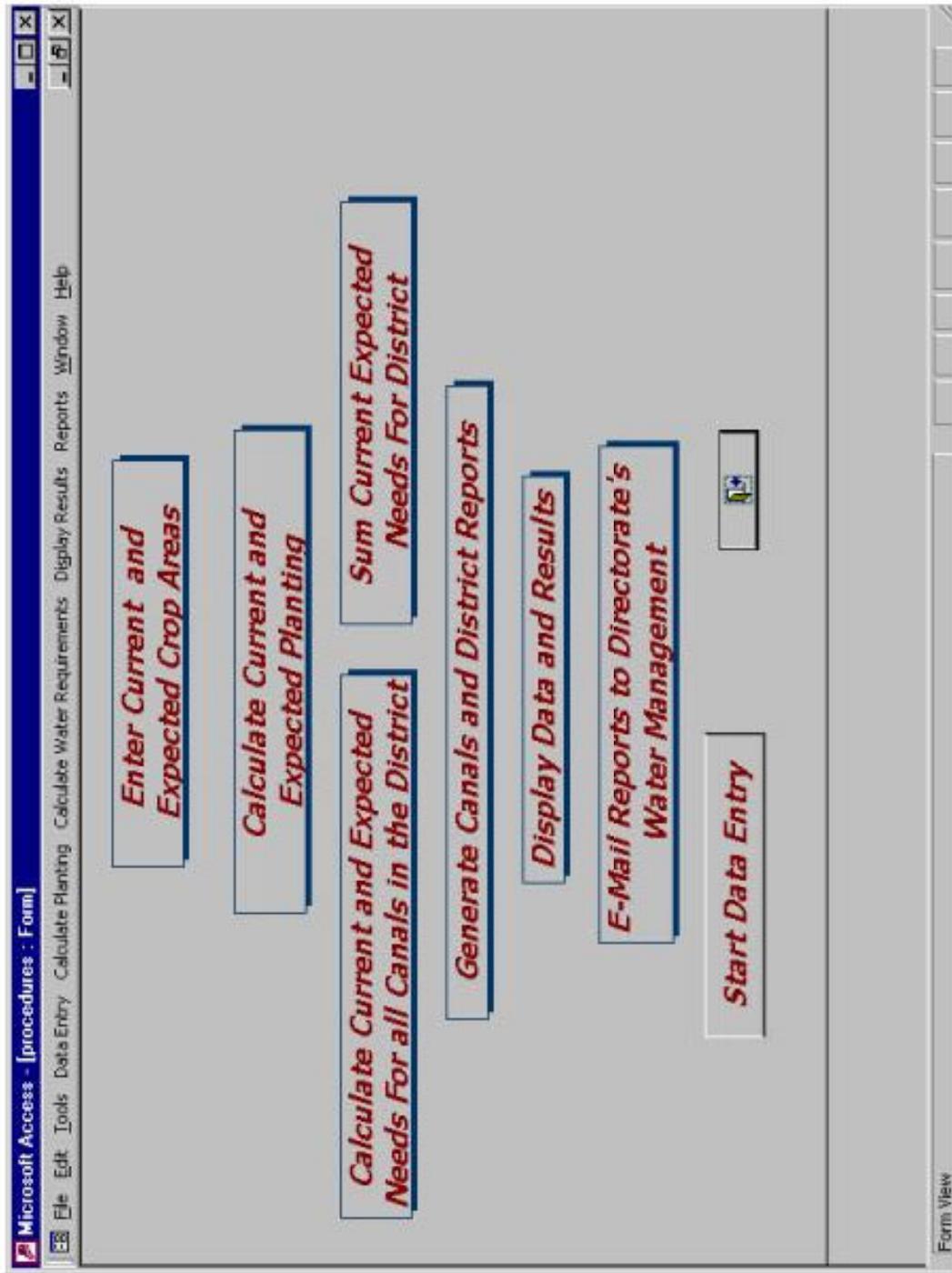


Figure 7-2. Crop water needs tool procedure.

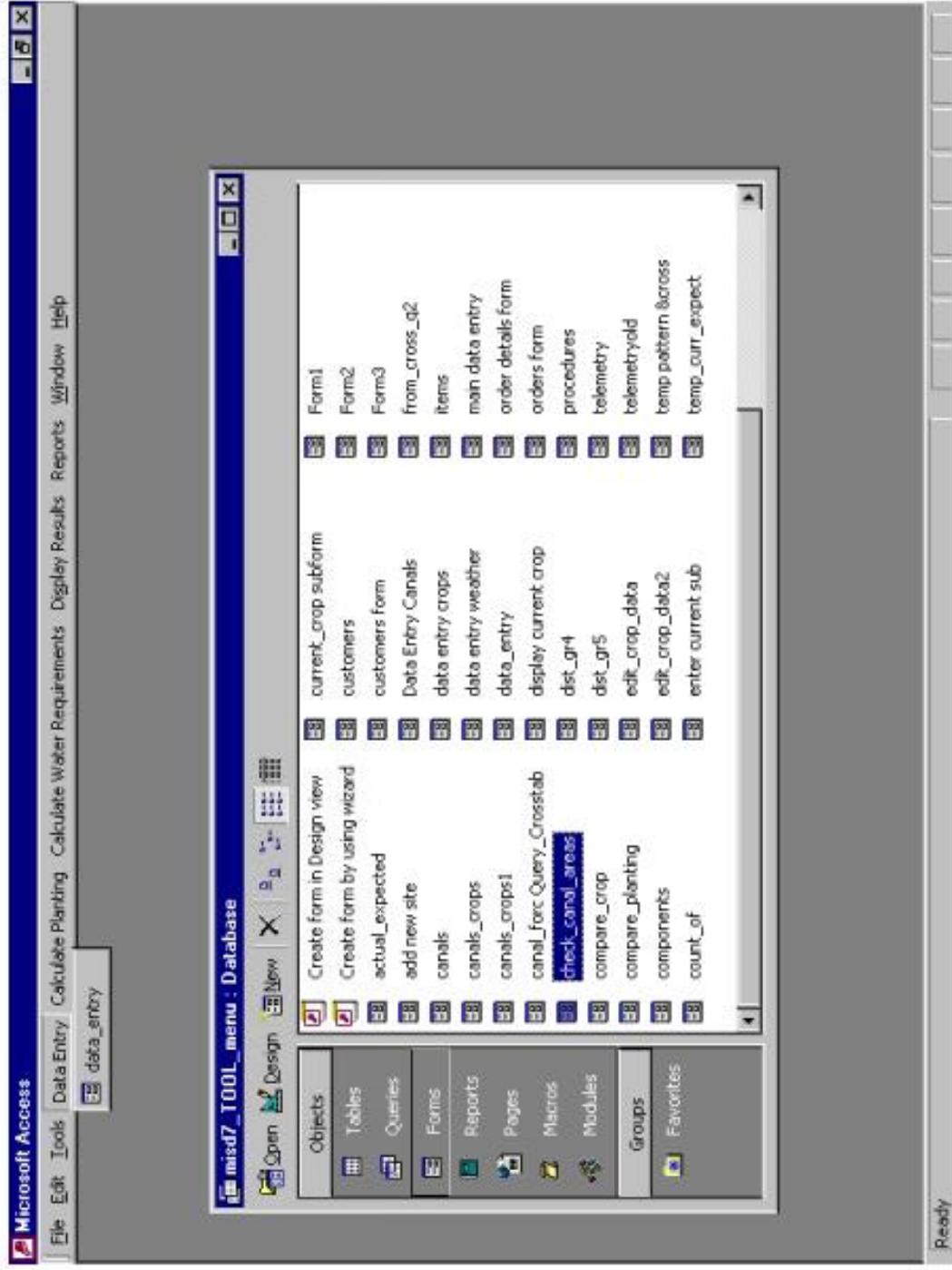


Figure 7-3. Main menu and data entry pop up menu.

displayed to the user showing all possible data entry operations. Figure 7-4 shows the “Data Entry” form with the six options for the user to choose from. The form also displays information for the last period for which crop data are available in the data base, the recommended period for data entry, and the current date and current half-month time period (1 to 24). Out of the six options displayed, four options are enabled, namely the Add New, Edit, Copy and Delete cropping pattern for a specific period of the 24 (half-month) periods of the year. Other operations are only allowed for the system manager and they deal with the editing of district configuration data. The details of each option are as follows:

- 1- Add New Crop: This option displays a list box having all the crops available in the database for the user to choose from. A note is put on this same form as a reminder for the user to always include Fallow as one of the chosen crops. Figure 7-5 shows the list box displaying all crops available in the current database. When the user chooses the list of crops that needs to be entered, it is automatically assumed that he is editing data for the period following the last period available in the database. Again the recommended period is displayed in the “Data entry” form below the label box titled **“Recommended time period to add”**, on the two text boxes displaying the year and the time period.

If the user is regularly entering data, he/she would choose this option during the current period and she/he would be entering data for actual current and next (expected) time periods. Seeing Figure 7-4, one can observe that the last available cropping pattern record in “Abo Hommos” irrigation district of “Behira” general directorate, is the record corresponding to period 13 of the year 2001. The next period to add, therefore, is the 14th period of the same year. The Access tool queries the data base and displays this for user information.

Note:

If the current period is the last period in this year, then the next time period will be calculated as the first period (January 1 to 15) of next year.

Once the user chooses to continue, another form will appear allowing the user to enter cropped areas for all chosen crops and for every canal in the district. Figure 7-6 shows one such data entry form for “Abo Hommos” district and for period 14 of year 2001. The user can scroll through all canals by changing the canal navigation button at the bottom of the form and can scroll through all crops using the crop navigation button at the middle of the form. For this district, 29 canals are configured, and at this time period three crops are only included. For each canal, the user can change the crop name and enter current and expected areas for the crop he chooses.

This form has a checksum for the canal that the user is currently editing and two text boxes. The first shows the sum of areas entered for the canal while the second shows the area left unregistered for this same canal. This is intended to be a guide for the user in order for her/him to validate that the sum of cropped areas for the current canal should exactly match its total area served. The form also has a checksum button, which displays an “OK” message whenever the canal passes the validation test. It is therefore recommended that **after entering all data for current canal, the checksum button is pushed for further data validation.**

Microsoft Access - [data_entity : Form]

ES File Edit Tools Date Entry Calculate Planting Calculate Water Requirements Display Results Reports Window Help

MISD DATA ENTRY

Data Entry Options

- Add New Crop Pattern**
- Edit Old Crop Pattern
- Edit Canals
- Edit Crops
- Copy Last Pattern
- Delete Specific Period

Today 1/27/02

CURRENT PERIOD 2 OF YEAR 2002

LAST PERIOD IN DATA BASE 13 2001 ▶

Recommended Period To Add

Year	Period
2001	14



Form View

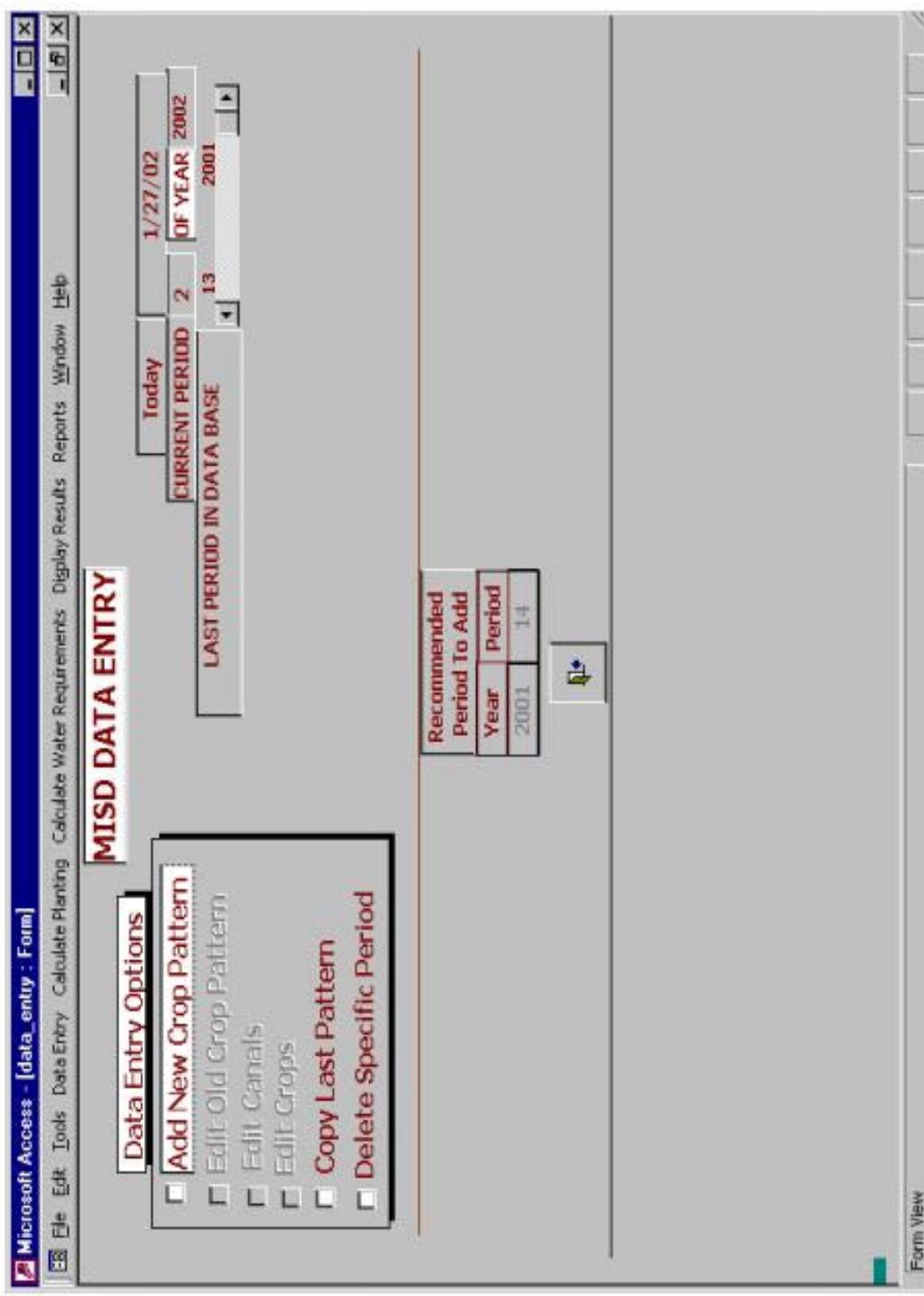


Figure 7-4. Data entry form options.

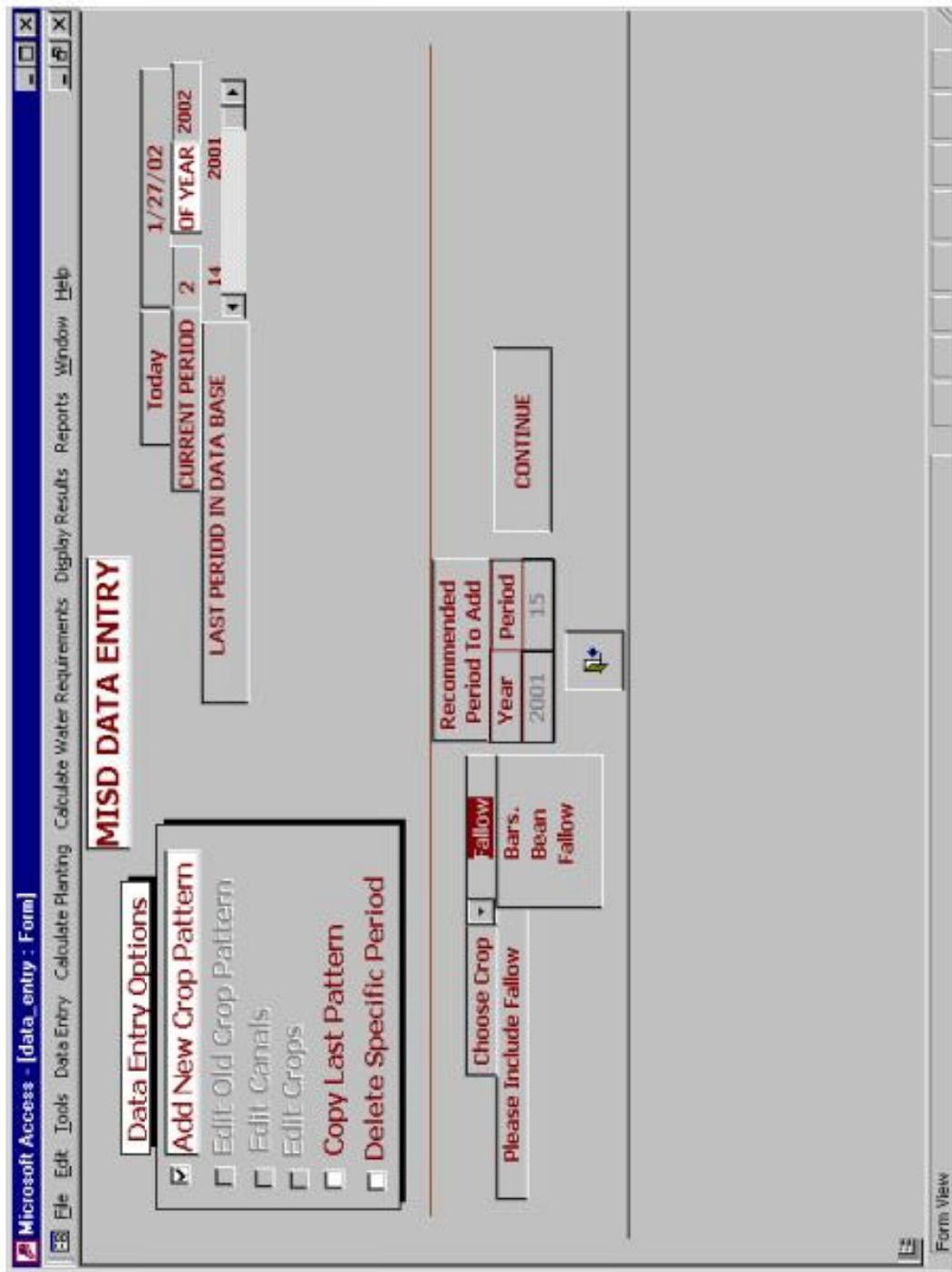


Figure 7-5. User input through the crop list box.

Microsoft Access - [canals]

File Edit Tools Data Entry Calculate Planting Calculate Water Requirements Display Results Reports Window Help

Canal No	Canal	Hanlaas/markaz	Area Served (fedians)
► 3 Bestoway		Abou Hammos	32.95

Year	Period	Canal No	Crop Name	Current	Expected
► 2001	15	3	Bean	1050	790

Change Crop	Total Current Area	1050 (Feds.)
Record: ► ◄ 2 ► ► ► 1 of 3	Area Left Unregistered	2245

Check Sum for Current Canal

Change Canal	Exit
Record: ► ◄ 3 ► ► ► 1 of 29	Form View

Canals

Figure 7-6. Add crop data entry screen one.

It can be seen in Figure 7-6 that the registered area is less than the canals area served, while in Figure 7-7 the match occurs, and a message is displayed saying:

“Cropped Area Matches Area Served (OK)”

This message is displayed when the user presses the checksum button after registering areas for all crops irrigated by this canal. If the user wants to quit this form, another similar form occurs, but this time showing the number of unmatched canals and again allowing the user to re-edit those canals. Figure 7-8 shows one such form where only one canal passed the validity check, since the number of unmatched canals is 28.

Again, if the user decides to quit the data entry screen, a form will be displayed for a last validation check. This form is shown in Figure 7-9. This form shows the number of canals failing the checksum together with a list box displaying the list of canal names. The user is then given three save options: (1) quit and delete entered data, (2) return to previous screen, and (3) save the entered data.

- 2- Edit Old Crop Pattern: Here the user can choose any available period in the database and start editing all canals as shown above. The only difference between this operation and the previous one is that the user here edits old (or previously entered) record (period) – while in option 1, he adds a new period to the database.
- 3- Edit Canals: This is a part of the district's configuration process, it is only available for the system manager and will be discussed in details in a system manager's manual that is separate from this report. Here, the system manager adds a canal record to the database, the record includes canal names, area served and the district to which the canal belongs.
- 4- Edit Crops: This is the same as Edit Canals except that, the crop record includes crop ID, name and whether this is a perennial or non-perennial crop.
- 5- Copy Last Pattern: This feature allows the user to copy the last period's crop data to the current period. It is to be noted that the copy feature does not just allow the user to copy any period to any other one. This is again to preserve continuity in data records and to prevent having gaps in the database. As will be seen in Chapter 8, continuity in the database produces accurate results. When the user chooses this option, the program will start the copy process.
- 6- Delete Specific Period (Crop Pattern): This option allows for the deletion of data for a certain period. If the user chooses to do so, an Access form will be displayed showing the user all the available periods. Now that period 14 has been edited, the database has records up to period 14 of year 2001, and the recommended period to add is the 15th period of year 2001 (see Figure 7-10). Figure 7-11 shows the form designed for deletion, in this form a list box showing all records available in the database is displayed. The user can choose from the list of available periods, the record for which the cropping pattern is to be deleted.

Note: Gaps in the database are not recommended, the user should always delete last period available in the database and the copy option automatically copies the last available period to a new following one.

Microsoft Access - [canals]

File Edit Tools Date Entry Calculate Planting Calculate Water Requirements Display Results Reports Window Help

Canal No	canal	Handasa/markaz	Area Served (feddans)
1	Abo Tahoon	Abou Hommos	3105

Year	Period	Canal No	Crop Name	Current	Expected
► 2001	15	1	Bars.	1000	0

Change Crop	Total Current Area	3105 (Feds.)
Record: 1 1 1 1 1 1 of 3	◀ ▶ ▷ ▷ ▷ ▷	◀ ▶ ▷ ▷ ▷ ▷

Area left unregistered

Cropped Area Matches Area Served (OK)

Check sum for current Canal

Change Canal

Form View

Figure 7-7. Crop entry screen one, canal checksum message.

Microsoft Access - [check_canal_areas]

File Edit Tools Date Entry Calculate Planting Calculate Water Requirements Display Results Reports Window Help

Canal	No.	Area (Feds.)	District
Berket Atlas		2476	Abou Hammou

Crop Details

Year	Period	Canal	Crop Name	Current Expect
► 2001	15	2	Bars.	0 0

Change Crop

Total Current Area	0 (Feds.)
Record: 1 of 3	1 ► ▶ ▶ ▶ of 3

Area Unregistered for Current canal 2476 (Feds.)

No of Unmatched Canals 20

Check Total Area for Current Canal

Save Data

Change Canal

Record: 1 of 28

Print View

Figure 7-8. Crop entry screen two, number of canals failing validation test.

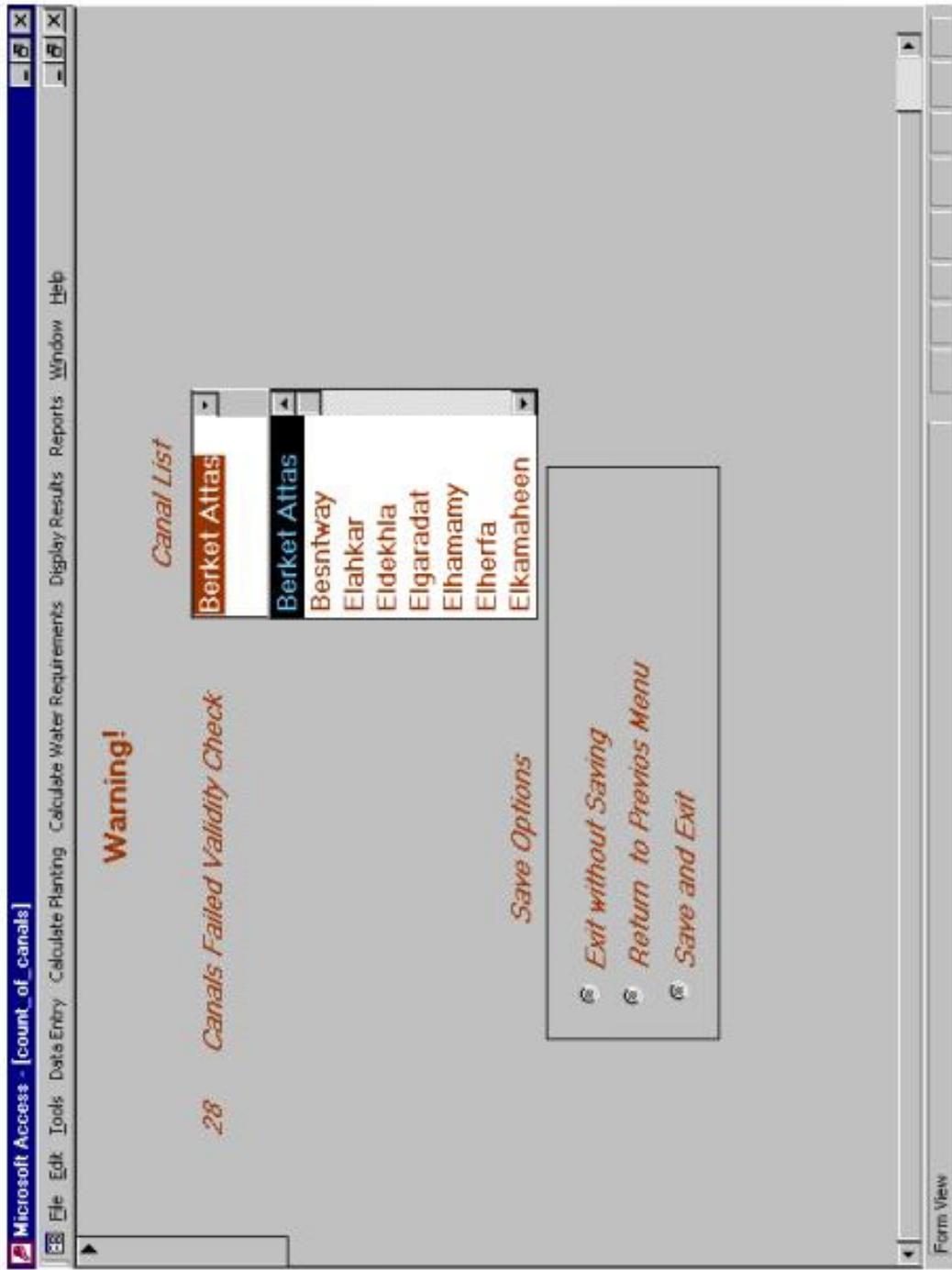


Figure 7-9. List of canals failing checksum and save options.

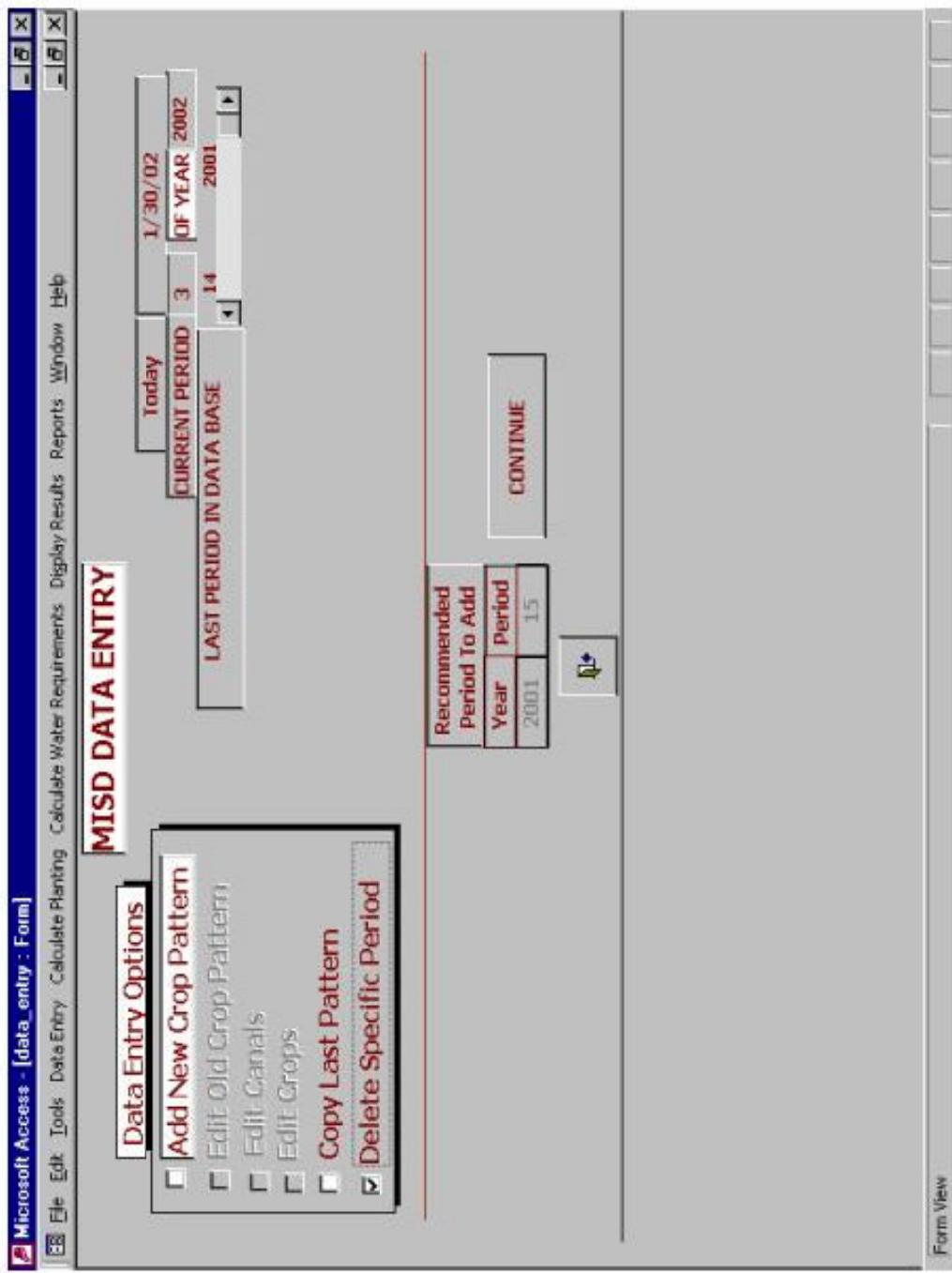


Figure 7-10. Last available data period and period recommended to add.

Delete Specific Period **Abo Hommos District**

Choose Period *Your Choice To Delete*

Period No. 14 Of Year 2001	
2001	7
2001	8
2001	9
2001	10
2001	11
2001	12
2001	13
2001	14

Delete **Cancel**

Form View

Figure 7-11. Delete option form, list of available periods.

7.5.3 Calculate Planting, Main Menu Item

This is a main menu item that displays a popup menu allowing the user to start calculating planting and expected planting for all available historic patterns. The first is calculated as the difference between current and previous area for each crop and canal. While the second is calculated as the difference between the next (expected) and the current area for each crop and canal in the district. The two items thus initiate two separate calculation procedures and simply prompt the user with a “**Calculation completed**” message after termination (see Figure 7-12).

Note:

- 1- It is recommended to do this step after data entry is accomplished and before water requirements are calculated.**
- 2- Menu items specific to this tool occur in the main menu bar in the order that should be followed for efficient and accurate utilization of this tool. Please refer to the procedures form presented above.**

7.5.4 Calculate Water Requirements, Main Menu Item

Figure 7-13 shows the “Calculate Water Requirements” menu and pop-up menu items. This is also a specific water needs tool, prepared for the user such that he can easily calculate current and expected water requirements, respectively, through first and second pop-up items. This is actually the main purpose of the crop water needs program. It is advised that this step be done after “Calculate Planting” and “Data Entry” activities have been done. The two procedures calculate water needs for all time periods, canals, and crops available in the data base. These two programs are initiated by clicking the pop-up menu items and again the programs display a successful completion message after termination.

Note:

- 1- In order to ensure data integrity, the procedures for calculating current water requirements, initiates planting calculations programs before starting its specific calculation procedure. This is done in order to avoid any discrepancies that may occur if the user forgets to run planting calculation procedures.**
- 2- For detailed information about the model, please refer to Chapters 4 to 6 of this report.**

7.5.5 Display Results, Main Menu Item

Through this item, the user is presented with a tool for observing and analyzing configuration and historic information (see Figure 7-14). There are four groups of information to be displayed through the pop-up menu of this main menu item as follows:

1. Water Requirement Historic Data: This presents a form on which the user can choose the start time (period number and year) and end time for displaying data.
2. Crop Information: This includes graphical and text display information about crop coefficients, comparison of historic crop areas for a certain year, canal, and crop in the data base; and same kind of comparison for expected crop areas.
3. Weather Information: This includes information about semi-monthly values of evapo-transpiration and rainfall depth (mm) within the district.

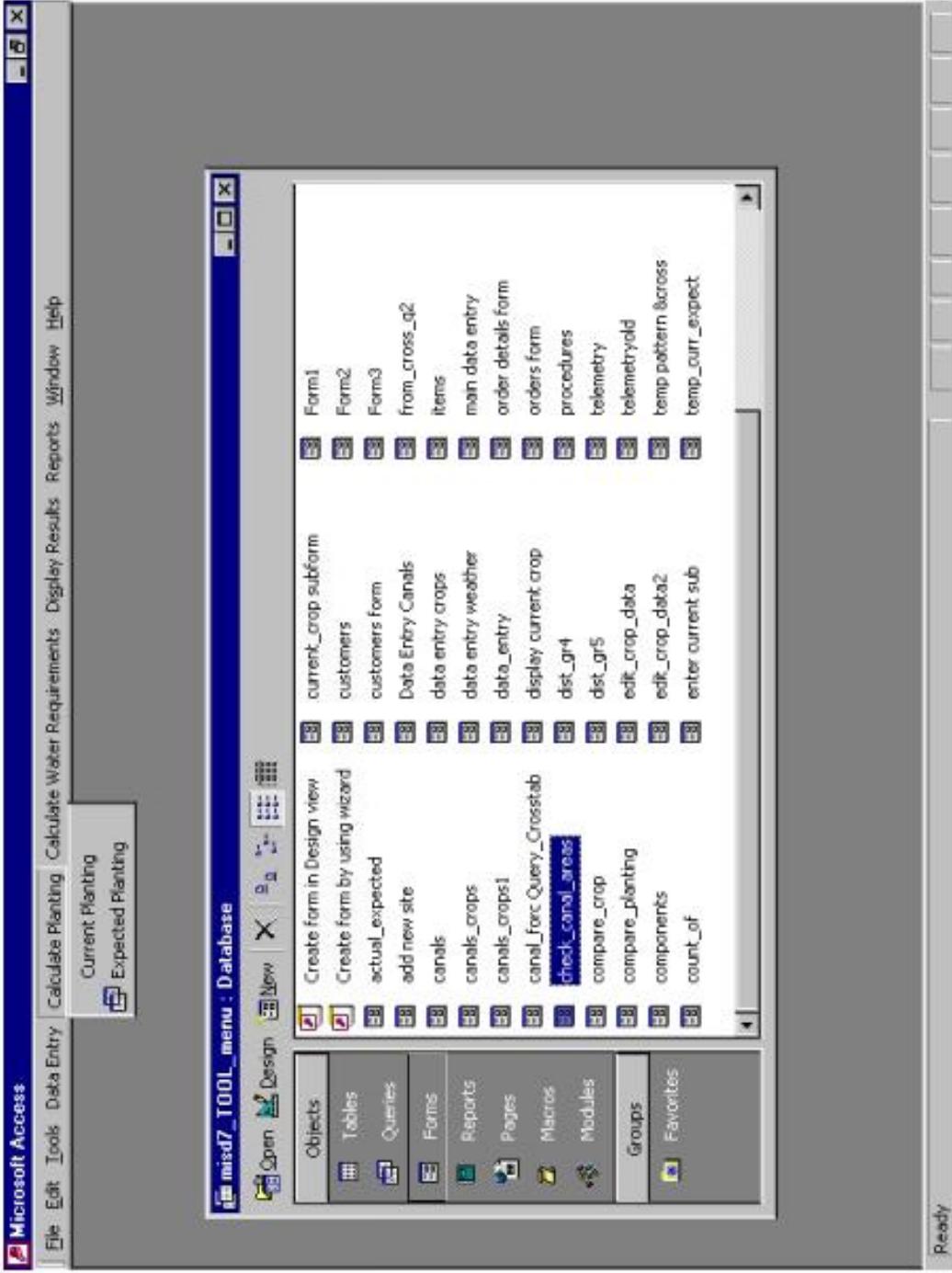


Figure 7-12. Calculate planting main and pop up menus.

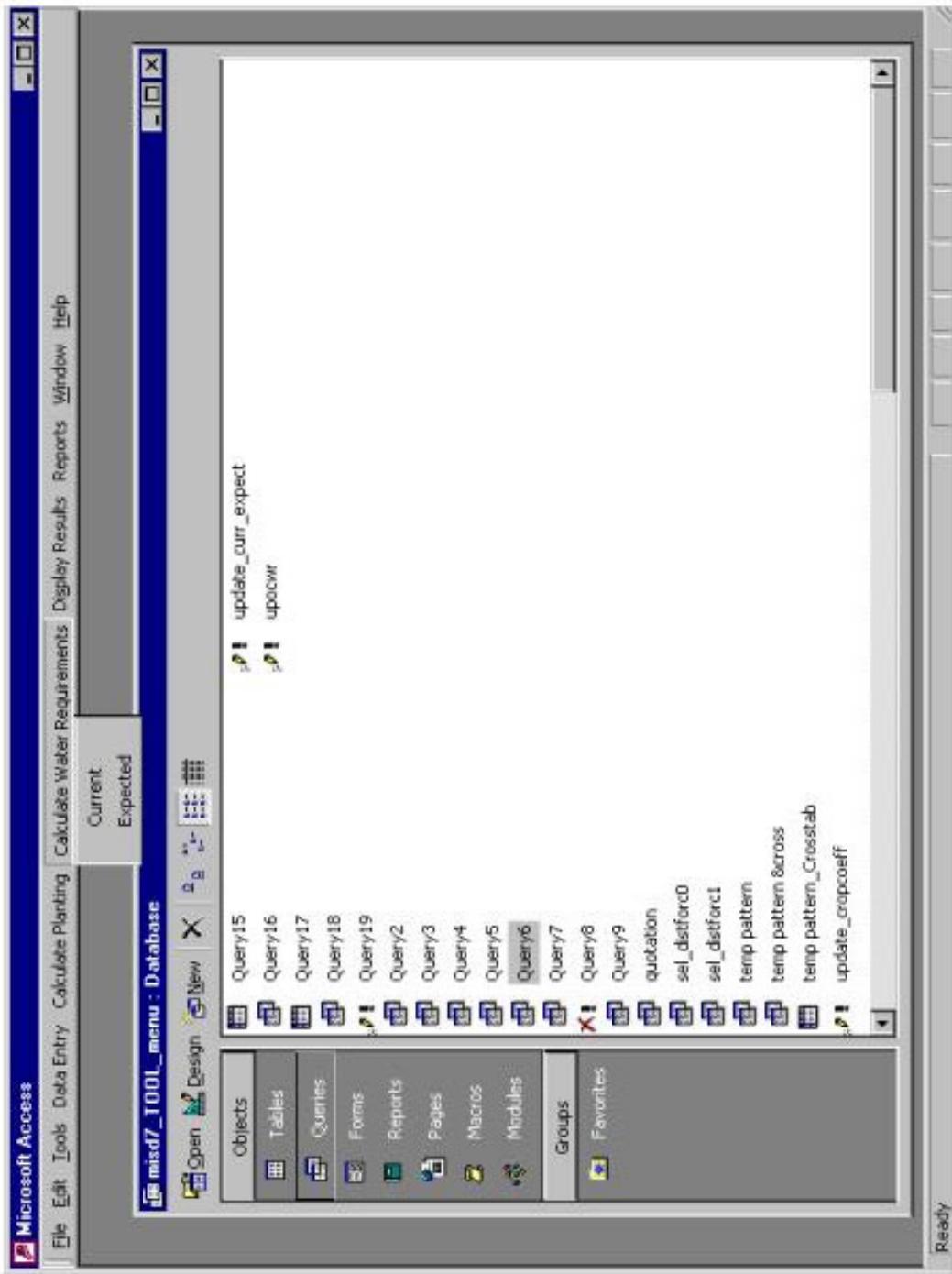


Figure 7-13. Calculate water needs main and pop up menus.

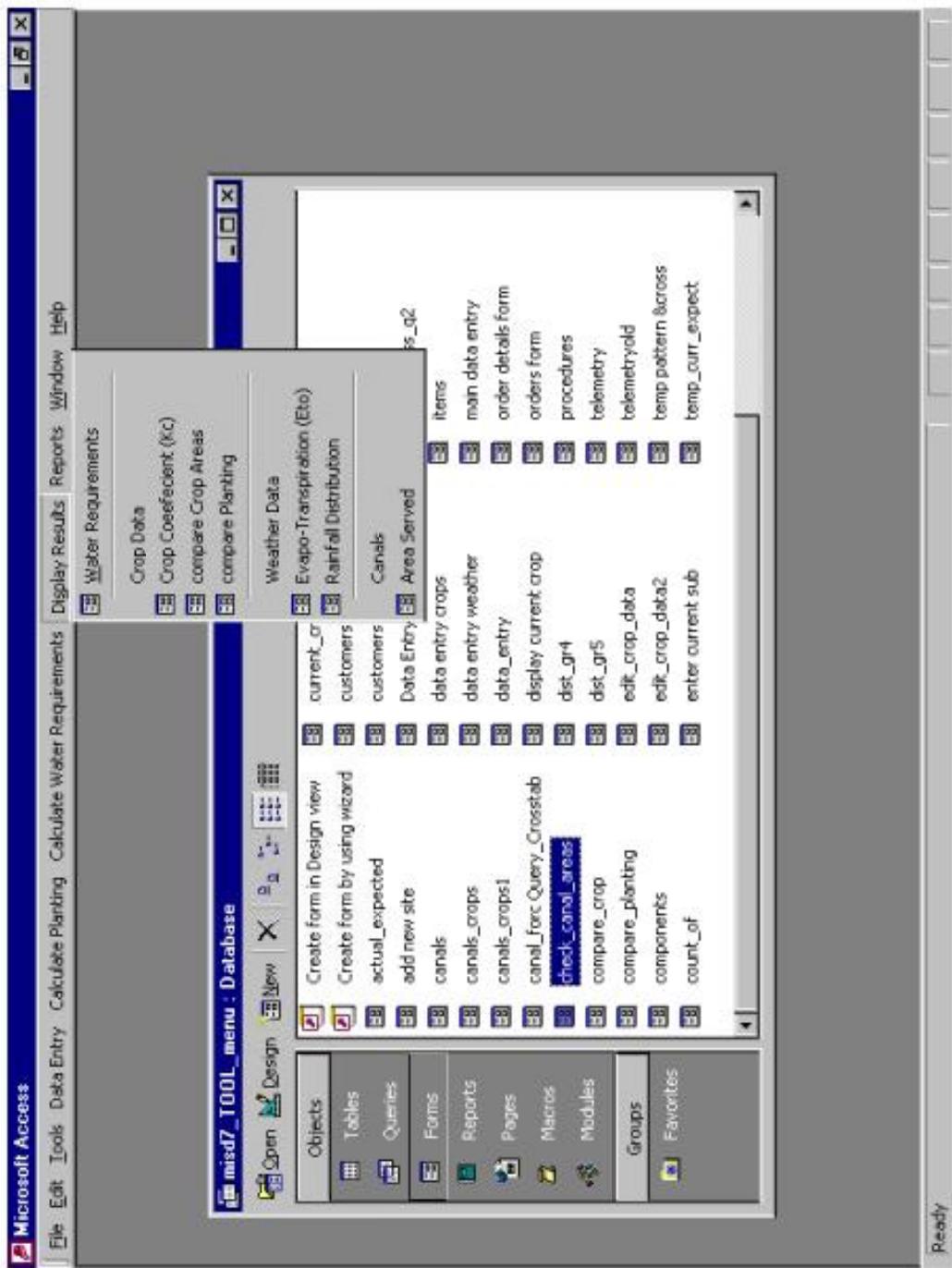


Figure 7-14. Display results main and pop up menus.

4. Canal Information: Including canal IDs, area served, and the name of the district to which the canal belongs.

7.5.6 Report Generation, Main Menu Item

This menu item helps the user generate reports on historic water needs, cropped areas, planting for individual canals and for the whole district for a defined period of time. Figure 7-15 shows the form having four types of reports for the user to generate. It can be seen that the user can preview, print, and send the report to higher administrative levels of the ministry (see Figure 7-16). The report will be sent as an e-mail attachment that will be displayed to the user to enable her/him to edit the message including changing any other pre-set attributes.

Note:

1. *This step assumes that Microsoft Outlook is installed within the Microsoft Office software on the district's computer where this tool is to be run.*
2. *E-mail configuration is part of the district's specific configuration.*

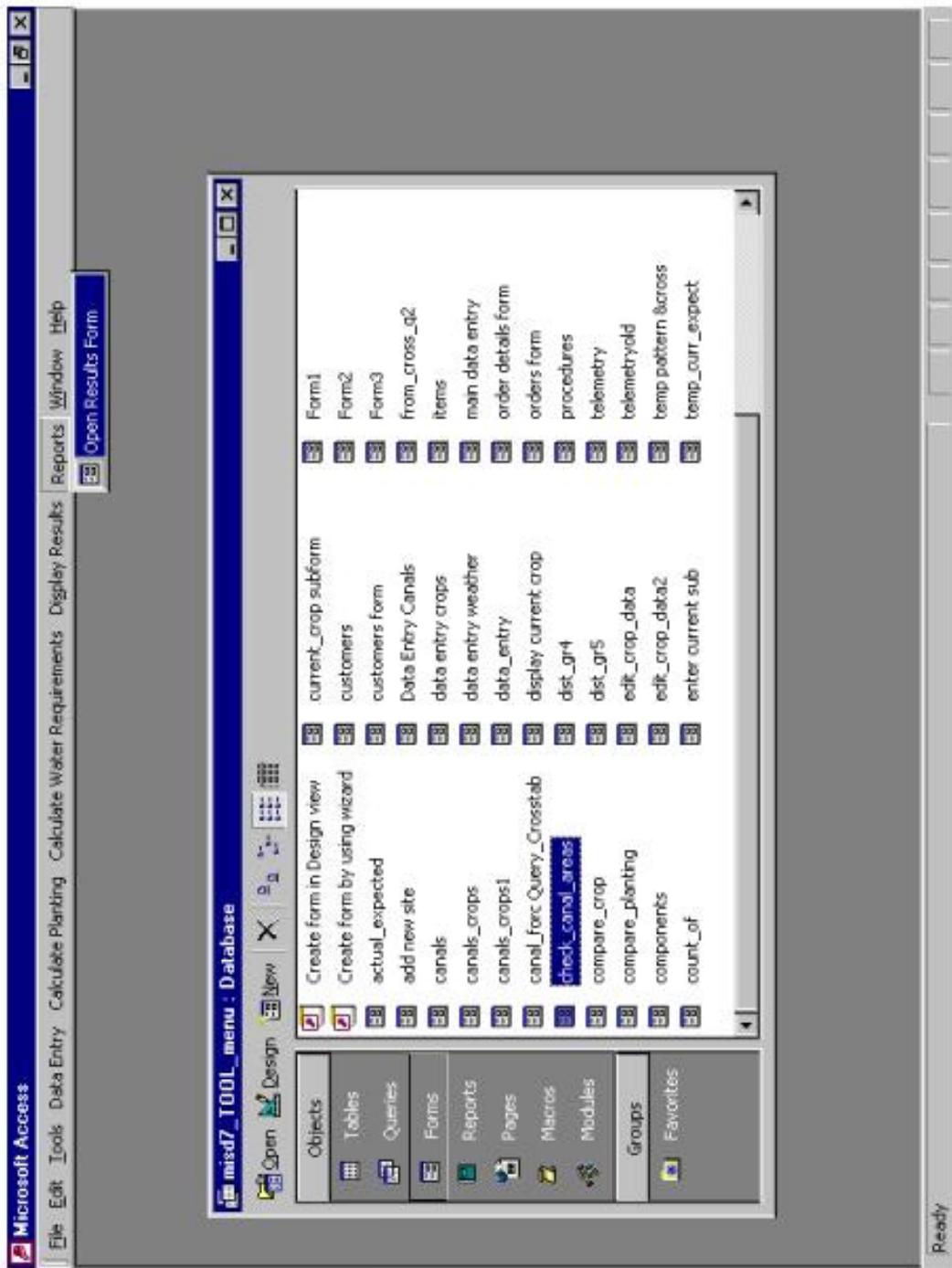


Figure 7-15. Reports main and pop up menus.

Microsoft Access - [dist_gi5 : Form]

File Edit Tools Data Entry Calculate Planting Calculate Water Requirements Display Results Reports Window Help

MISD Results For Abo Honomos District

Reports / Results

- Cropping Pattern*
- Canal Forecast*
- District Forecast*
- Seasonal Statistics*

PRINT

PRINT PREVIEW

Form View

A screenshot of a Microsoft Access form titled "MISD Results For Abo Honomos District". The form has a dark blue header bar with standard menu items: File, Edit, Tools, Data Entry, Calculate Planting, Calculate Water Requirements, Display Results, Reports, Window, and Help. Below the header is a large title "MISD Results For Abo Honomos District". Underneath the title is a section labeled "Reports / Results" with a black border. Inside this section is a list of four radio button options: "Cropping Pattern", "Canal Forecast", "District Forecast", and "Seasonal Statistics". To the right of the "Reports / Results" section are two buttons: "PRINT" and "PRINT PREVIEW", each with a small icon above it. At the bottom right of the form is a "Form View" button. The background of the form is light gray.

Figure 7-16. Reports generation form.

8 Crop Water Needs Microsoft Access District Analysis

8.1 Introduction

Chapter 7 describes the User Interface of the Microsoft Access version of the MISD Crop Water Needs tool. This chapter discusses results obtained from utilizing this tool in analyzing crop patterns and calculating canal water requirements at the district level. Examples are given as to how to use this tool to systematically accomplish MISD tasks. The procedure followed here is similar to that displayed in the user interface of the crop water needs tool on the procedure form of the welcome screen (see Figure 8-1). This form will remain opened as long as the program is running and the user did not intentionally close it. This is meant to be a reminder for the district engineer (or any other user) of the different MISD tasks.

Also, Chapter 7 gives an extensive description of the data entry activity. Measures to ensure data quality and integrity are embedded in the data entry screens/forms. After data entry of observed and projected cropping pattern information, the next steps are to start calculations, analyze data, generate reports, and send water needs reports to higher levels within the Ministry. The district engineer (or other user) is advised to proceed as follows:

8.2 Observe Configuration Data

Before starting any calculation, the user is advised to observe the district's configuration data. This is the static data of the system and the user is only allowed to view it. Water calculations are very sensitive to this type of data so the user must be sure of having the right description of the canal system, crop definitions and coefficients, and the weather data that are appropriate for the district. The user should select the "display results" main menu option (see Figure 8-2) to display crop, canal, and weather data from the corresponding pop-up menu item. Figures 8-3 through 8-5 show configuration data for the "Abou Hommos" district of the "Beheira" directorate. In the current step, the user should make sure that all canals are included and that they have the right area served by each canal. Also he/she should make sure that all crops for all seasons are included and that crop coefficient and other crop definitions are correct and that semi-monthly weather data are realistic.

Note:

- 1- Calculation of water requirements depends on the whether or not the crop is perennial.*
- 2- If any inconsistency arises in these data, the district engineer should contact the ministry headquarters to re-configure the district's tool.*

8.3 Check Crop Pattern

If the user is satisfied that all canals and possible crops are included in the data base, she/he should go ahead and enter data for first time period if it is the first time she/he enters data to the system. However in this chapter, it is assumed that the district engineer has enough data to analyze historical crop patterns and crop water needs. For the purpose of this discussion, it is assumed that the district engineer at "Abou Hummus" has entered data for October 16-31 (period 20), 2000 through July 1-15 (period 13), 2001. The engineer should then enter new

data and analyze crop pattern results for any canal, crop, and specific period of interest. This is shown in Figure 8-6 and can be viewed by choosing the “Compare Crop Pattern” pop-up menu item of the “Display Results” main menu. In this figure, the user has chosen a comparison between current and historical cropped areas for rice on the El-Herfa canal in 2001. Since data are not available beyond period 13, the graph displays records from period 1 to period 13 of same year (2001). The user can also make further validation by choosing to print the crop pattern report using the reports main menu item. Figure 8-7 shows the report generation form of the water needs user interface. The user selects the crop pattern report option on this form to generate a report for Herfa canal for the periods 1 through 12, 2001. Table 8-1 shows a snapshot for period 1, 2001 from the output report.

This report has an advantage in that it compares the cropped area on a certain canal for all available periods in the system’s database. A check is implemented to ensure that the total cropped area (including fallow) matches the total area served. Again this is another tool for the district engineer that helps revise data and remove any inconsistency.

Note:

The last existing crops are for period 13 (July 1-15) and the next period (period 14) has projected cropping area “Expected” to exist in the next half-month (July 16-31).

8.4 Calculate Planting

Next, the user should initiate calculations for current planting and expected planting using the “Calculate Planting” main menu item as follows:

8.4.1 Current Planting

Click the pop-up menu item titled “Current” to initiate the calculation of current planting. Table 8-2 shows a text format of the Visual Basic procedure developed for that purpose.

8.4.2 Expected Planting

Click the pop-up menu item titled “Expected” to initiate the calculation of expected planting using Microsoft SQL query language. Table 8-2 shows a text format of the query designed for that purpose.

8.5 Check Planting

In order to check the output of the previous step, the district engineer can follow the same steps as in section 8.3 to display a comparison of expected and current planting for a specific year and crop on a certain canal. Figure 8-8 depicts such a comparison for year 2001 and rice on the El-Herfa canal.

8.6 Calculate Water Needs

In this step the district engineer will start running the model for calculating water needs for all canals and crops within the district. It should be noted that the engineer should not start this step before validating data as shown in the previous steps. However, the macro developed for calculating water requirement is designed to automatically initiate planting calculations before starting the water requirements calculation procedure.

In order to start the calculations, the district engineer should choose the “Calculate Water Requirements” main menu item and one of the following pop-up menu items:

8.6.1 Current Needs

Choose the “Current” menu item of the pop-up menu to run the Visual Basic procedure developed to calculate the water needs for all available time periods on all canals in the district. Water needs are calculated based on crop, weather, and canal data. The procedure sums the current water requirements for all crops on every canal in the district and generates historical data files for canals and the district’s current water needs. Table 8-4 shows the Visual Basic source code for the procedure to derive current water requirements for all time periods in the database.

8.6.2 Expected Needs

Choose the “Expected” item of the pop-up menu to run the Visual Basic procedure developed to calculate the water needs for all available time periods in the water system. Water needs are calculated based on crop, weather, and canal data. The procedure sums expected water requirement for all crops and every canal in the district and generates historical data files for all canals and for the district’s expected water needs. Table 8-5 shows the Visual Basic source code for the procedure to derive expected water requirements for all time periods in the database.

8.7 Analyze Water Needs

At this stage the district engineer should look at the model’s output and look at the water requirements for each canal and the current and expected water needs for the district. The water needs tool generates many graphics and reports for comparing historic water needs with the most recent needs for canals and for the whole district. Figures 8-2 and 8-7 show the “Display Results” main menu item and the report generation form from the reports main menu item. These two items are considered the main means for analyzing MISD data.

8.7.1 Display Results

Figure 8-11 shows a comparison between current and expected water needs for the Abou Hommos district in million cubic meters. Through this option, the user can display water needs for any set of data available in the database of the crop water needs tool. It can be seen that the user can choose a start and an end date for the comparison. The district engineer can also print the graph displayed by clicking the “Print Graph” button on that same form.

8.7.2 Generate Reports

The report form allows the district engineer considerable flexibility for report generation. The form is designed such that the user can select a report type, enter a selection of report parameters, and preview, print, or send the report by e-mail. However, it is recommended that the user preview the report before printing or sending it via e-mail. This preview is very important since the size of the generated report varies according to the time span required by the user, especially in the case of crop pattern reports. The district engineer can generate

canal forecast reports (Table 8-6 and Figure 8-9), seasonal statistics for a specific canal (Table 8-7), and historical water needs on the district level (Table 8-8 and Figure 8-10).

8.8 Send Water Needs Report to Irrigation Directorate

The ultimate goal of this tool is to enhance data transfer procedures by utilizing state of the art technology and information systems. When the user is satisfied with the results obtained, she/he can simply select any report option and click the “send e-mail” icon (the command button to the right of the print command button). This will initialize a macro that puts an e-mail message in the outbox of Microsoft Outlook with the specified report attached in a rich text format (Microsoft Word compatible). When the user decides to send an e-mail to the directorate, the mail message will show up on a typical e-mail outlook composer window. This allows the user to edit or save the attached file, the pre-set message, or any other attribute of the e-mail composer.

Figure 8-12 shows the e-mail composer with the district forecast report attached. If the user is connected to the internet he/she can directly send the report. Otherwise, the e-mail message will remain in the outbox of Outlook Express and will automatically be sent whenever the user is online.

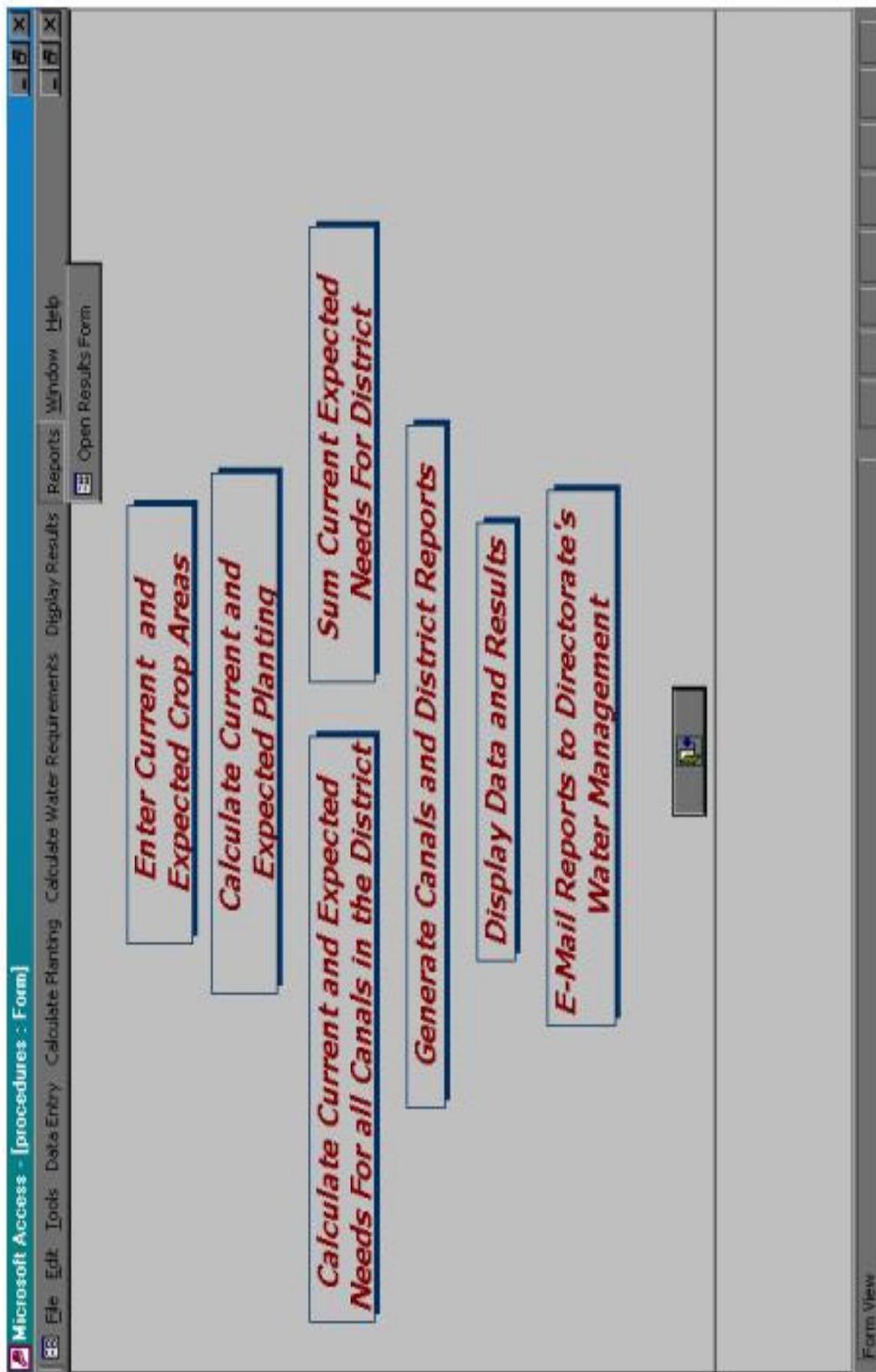


Figure 8-1. MISD procedures form.

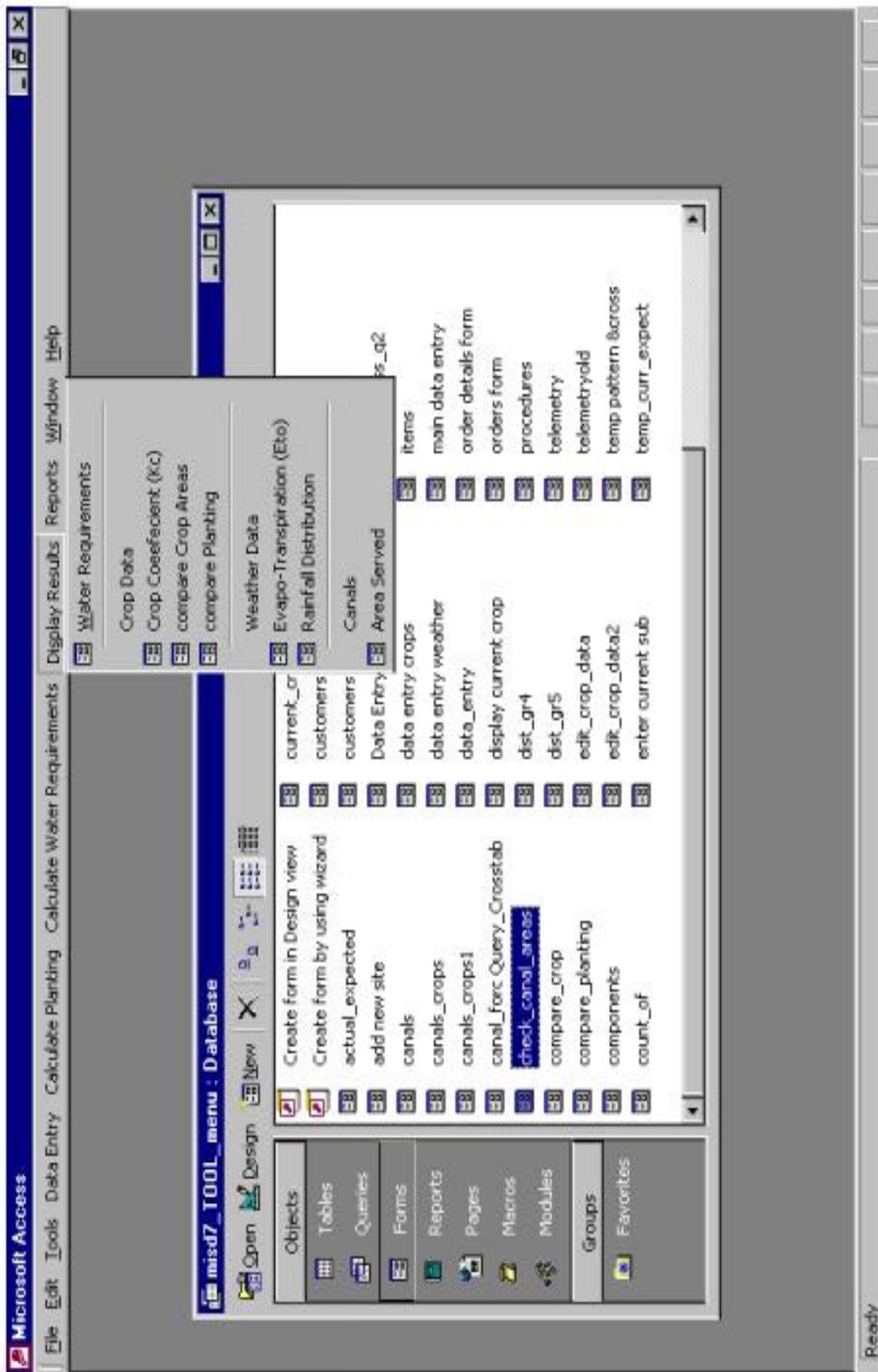


Figure 8-2. Display results pop up menu.

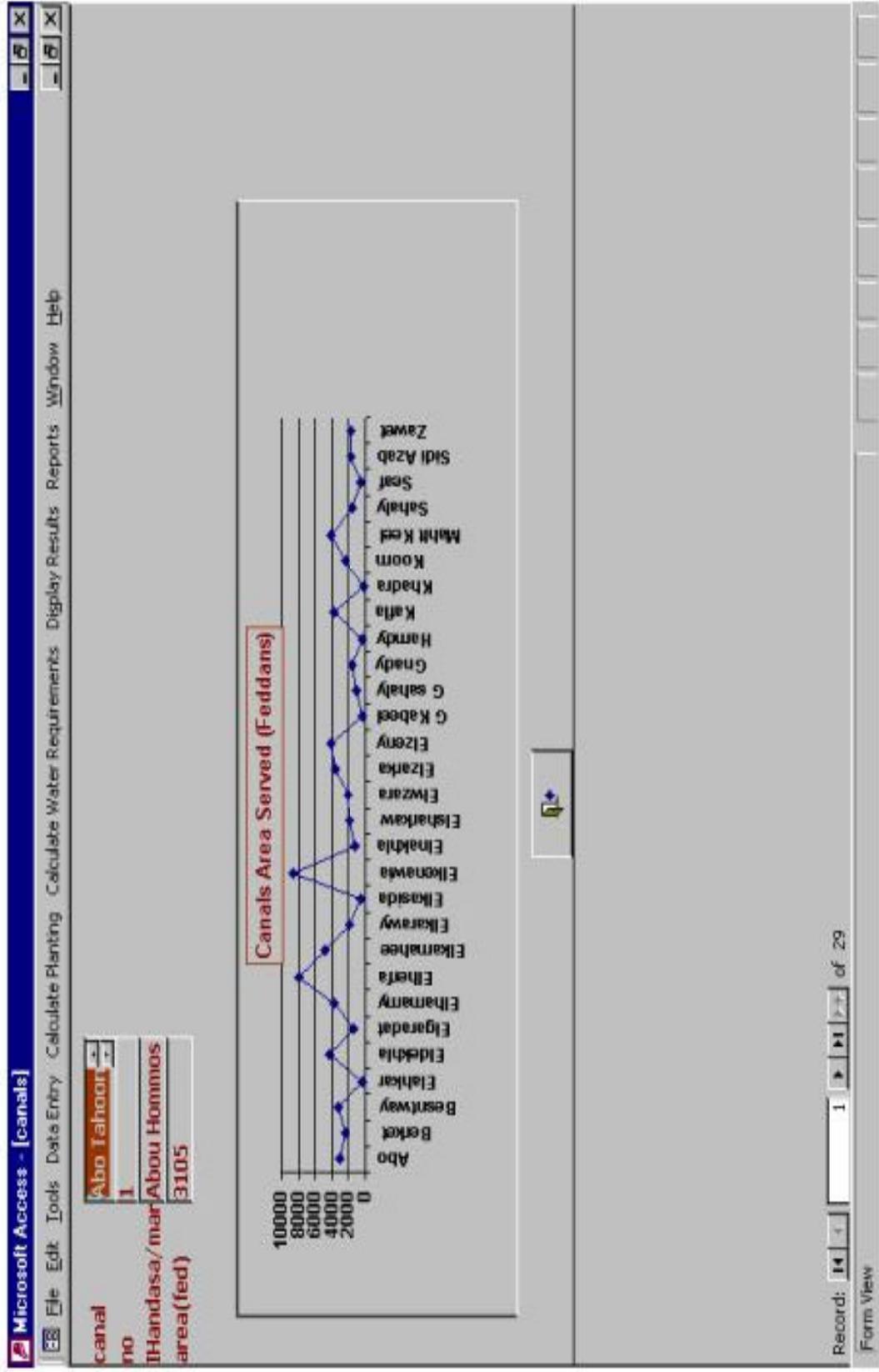


Figure 8-3. Canal configuration data for Abou Hommos Irrigation District.

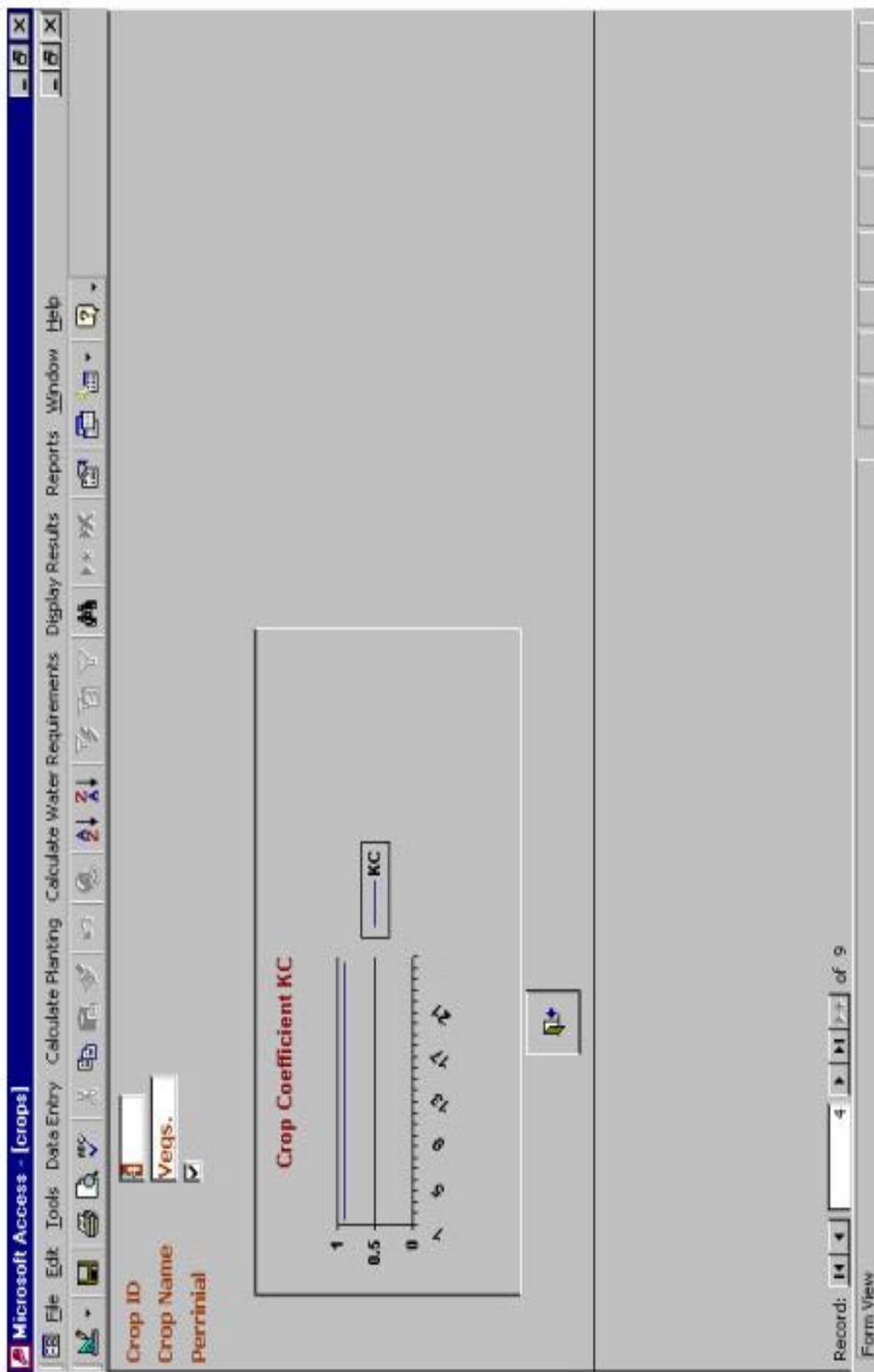


Figure 8-4. Crop data for Abou Hummus.

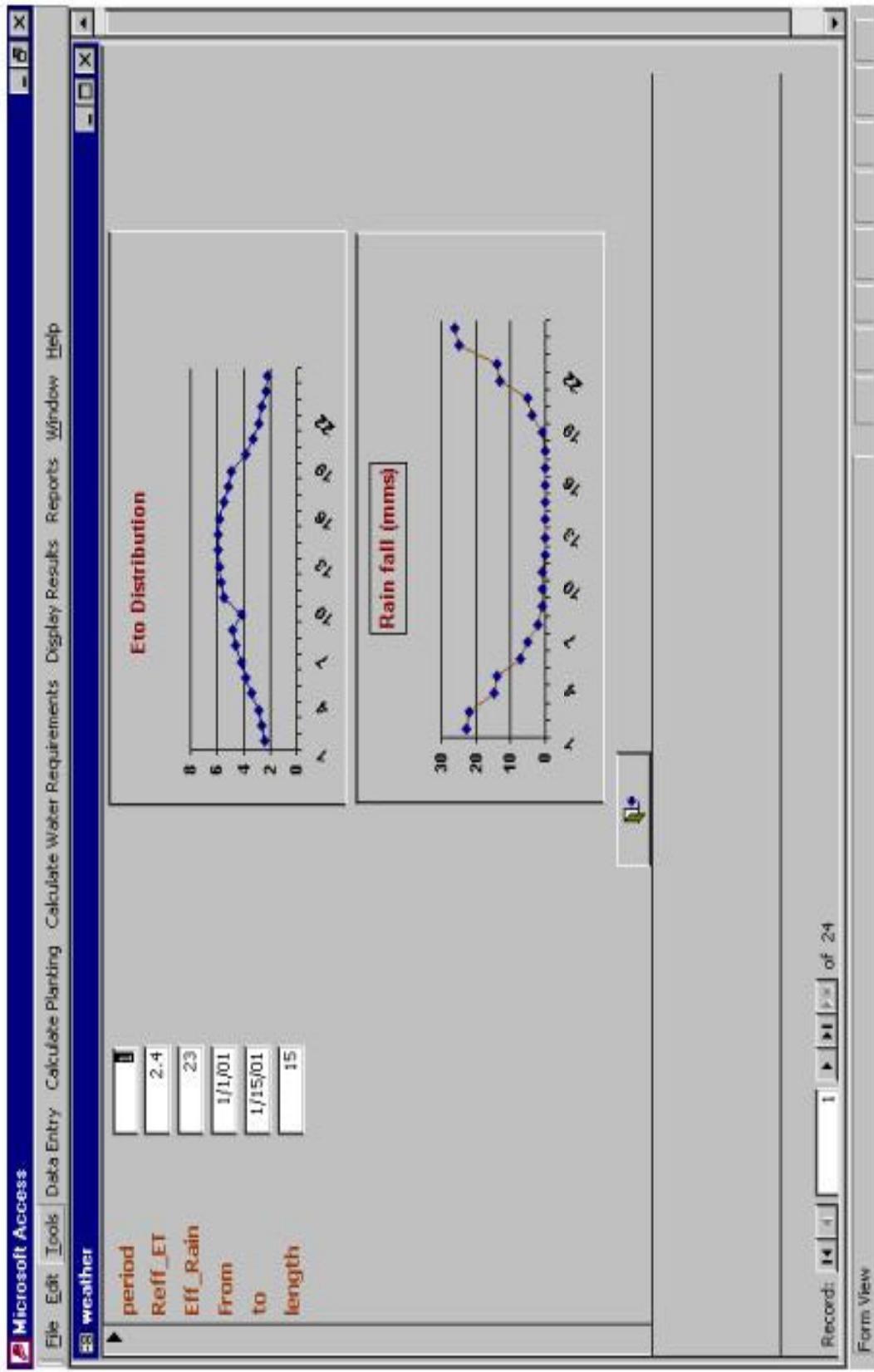


Figure 8-5. Weather data for Abou Hammus.

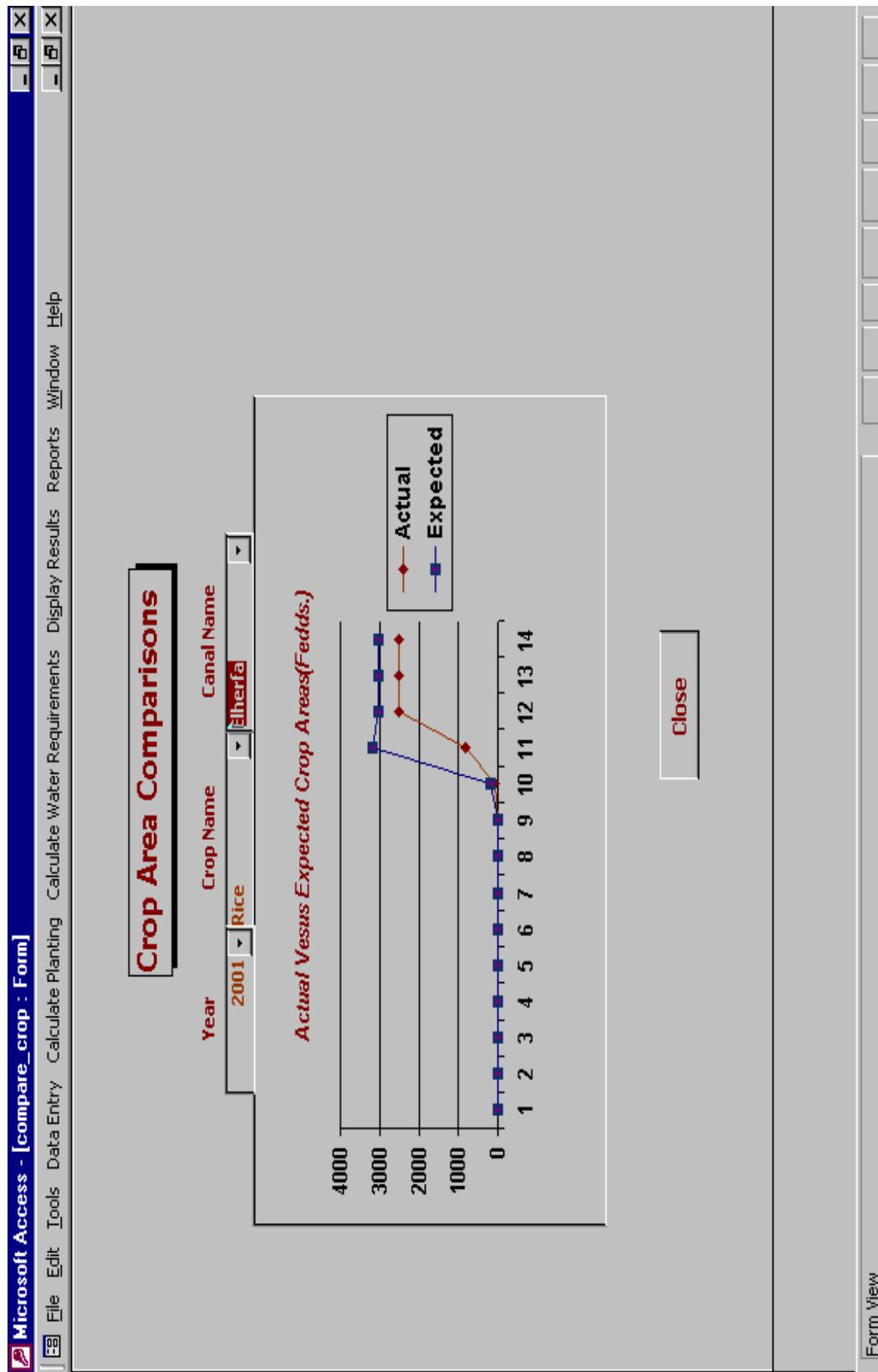


Figure 8-6. Comparison of actual and expected crop areas of rice on El Herfa Canal for 2001.

Microsoft Access - [dist_gu5 : Form]

File Edit Tools Data Entry Calculate Planning Calculate Water Requirements Display Results Reports Window Help

MISD Results For Abo Honomos District

CANAL

Elherfa

Reports / Results

Cropping Pattern
 Canal Forecast
 District Forecast
 Seasonal Statistics

Start Date End Date

2001 2001

Period No. 1 Of Year
2001

Period No. 12 Of
Year 2001

PRINT

PRINT PREVIEW

Form View

A screenshot of a Microsoft Access form titled "MISD Results For Abo Honomos District". The form has a "CANAL" section with a dropdown menu set to "Elherfa". Below this is a "Reports / Results" section containing four radio button options: "Cropping Pattern", "Canal Forecast", "District Forecast", and "Seasonal Statistics". To the right of these options are two date fields: "Start Date" and "End Date", both currently set to "2001". Underneath these date fields is a table with two rows: "Period No. 1 Of Year" and "Period No. 12 Of Year 2001". At the bottom of the form are two buttons: "PRINT" and "PRINT PREVIEW". On the far right, there is a vertical scroll bar and a "Form View" button.

Figure 8-7. Crop pattern report parameters (canal name, start date, end date).

Table 8-1. Crop pattern report for El Herfa Canal.

Cropping Pattern For Abou Hummus District							
Year	Period	Canal	Area Served	Crop	Crop Area	% Of Canal Area	
2001	1	Elherfa	7959	Bean	288	4	
2001	1	Elherfa	7959	Wht.	4038	51	
2001	1	Elherfa	7959	Vegs.	74	1	
2001	1	Elherfa	7959	Gards.	0	0	
2001	1	Elherfa	7959	Cott.	0	0	
2001	1	Elherfa	7959	Rice	0	0	
2001	1	Elherfa	7959	Maize	0	0	
2001	1	Elherfa	7959	Fallow	0	0	
2001	1	Elherfa	7959	Bars.	3559	45	
					Totals	7959	100%
						Page 1 of 13	

Thursday, January 24, 2002

Table 8-2. Current planting calculation procedure.

Option Compare Database

```

Option Explicit
Sub planting()
    DoCmd.SetWarnings False
    Dim mydb As Database
    Dim current As Recordset
    Dim expected As Recordset
    Dim crop As Recordset
    Dim canal As Recordset
    Dim period As Recordset
    Dim coeff As Recordset
    Dim dates As Date
    Dim p, pp, yy, cyy As Integer
    Dim cl As Integer
    Dim cr As Integer
    Dim i, j, k, fyear, fperiod, lyear, lperiod As integer
    Dim duty As Variant
    Dim sumw As Variant
    Dim suma As Variant
    Dim sumak As Variant
    Dim sumocwr, prevcurr, cc As Variant
    Set mydb = CurrentDb
    Set current = mydb.openrecordset("current_crop")
    Set expected = mydb.openrecordset("expected_crop")
    Set crop = mydb.openrecordset("crops")
    Set canal = mydb.openrecordset("canals")
    Set coeff = mydb.openrecordset("coeff_crop")
    Set period = mydb.openrecordset("period")
    current.Index = "PRIMARYKEY"
    expected.Index = "PRIMARYKEY"
    crop.Index = "primarykey"
    canal.Index = "PRIMARYKEY"
    coeff.Index = "primarykey"
    MsgBox "Calculating Planted areas for current period"
    cyy = year(date)
    canal.MoveFirst
    Do While Not canal.EOF
        cl = canal![no]
        crop.MoveFirst
        Do While Not crop.EOF
            k = 1
            cr = crop![Crop_ID]
            current.MoveFirst
            prevcurr = 0
            For i = 2000 To cyy
                For j = 1 To 24
                    current.Seek "=", i, j, cl, cr
                If Not current.NoMatch And Not current.EOF Then
                    current.Edit
                End If
                If k = 1 Then
                    current.Update
                End If
            Next j
            current.Update
        End Do
    End Do
End Sub

```

Table 8-2. (Continued).

```
current!["planting"] = current!["area"]
    k = k + 1
End If
cc = current!["area"] - prevcurr
If cc < 0 Then
    cc = 0
End If
current!["planting"] = cc
prevcurr = current!["area"]
current.Update
End If
Next j
If k = 1 Then k = k + 1
current.Seek "=", i, j, cl, cr
Next i
crop.MoveNext
Loop
canal.MoveNext
Loop
MsgBox "Calculations Completed"
End Sub
```

Table 8-3. SQL statement for calculating expected planting.

```
Expected Planting SQL statement
UPDATE (crops INNER JOIN current_crop ON crops.Crop_ID =
current_crop.crop_id) INNER JOIN expected_crop ON (current_crop.period =
expected_crop.period) AND (current_crop.year = expected_crop.year) AND
(current_crop.canal_id = expected_crop.canal_id) AND (crops.Crop_ID =
expected_crop.crop_id) SET expected_crop.explant =
IIf([expected_crop].[area]<[current_crop].[area],0,[expected_crop].[area]-[current_crop].[area]);
```

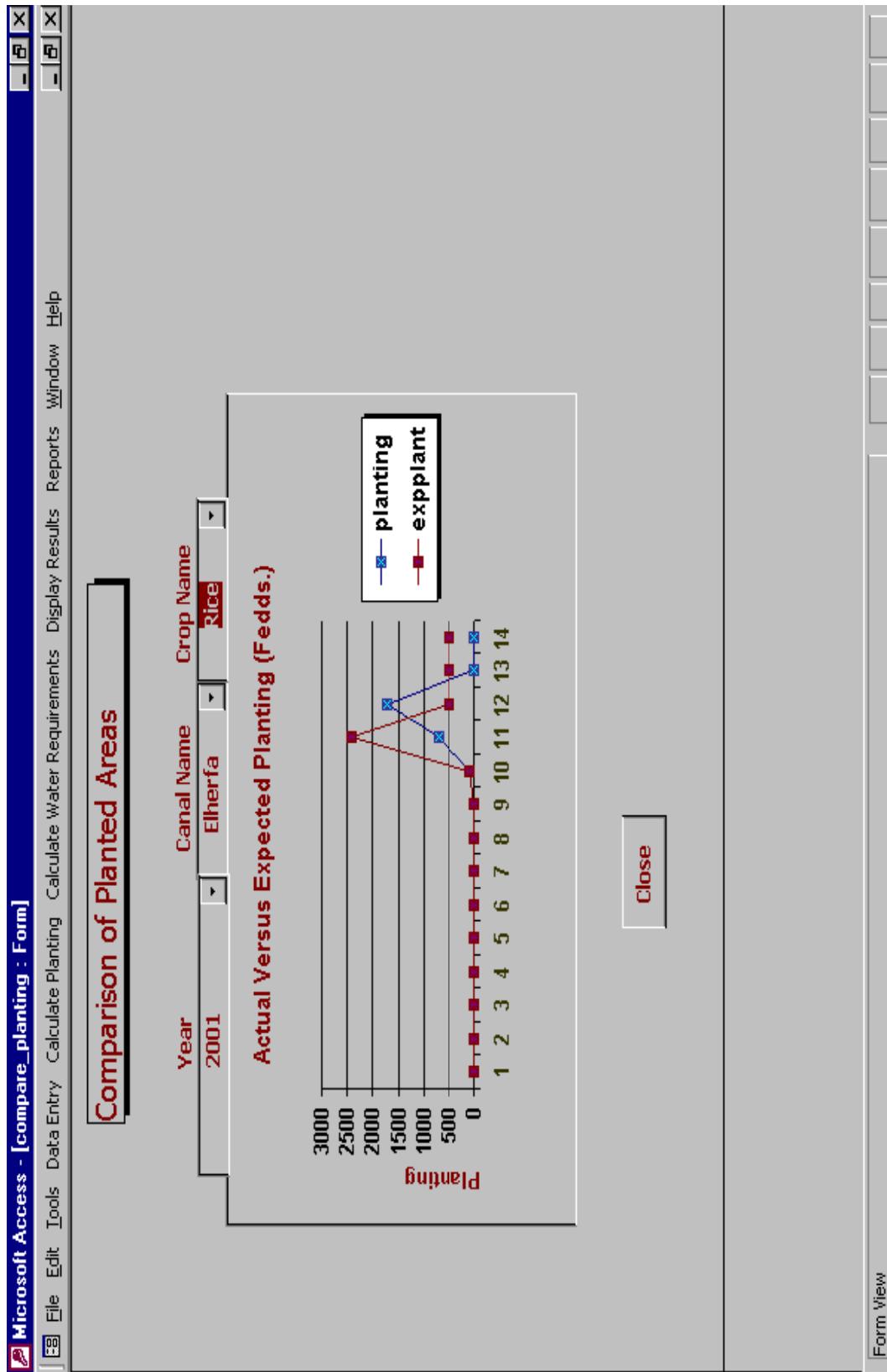


Figure 8-8. Comparison of actual planting and expected planting.

Table 8-4. Current water requirements calculation procedure.

```

Attribute VB_Name = "current"
Option Compare Database
Option Explicit
Function current_req()
    DoCmd.SetWarnings False
    Dim mydb As Database
    Dim current As Recordset
    Dim expected As Recordset
    Dim crop As Recordset
    Dim canal As Recordset
    Dim period As Recordset
    Dim coeff As Recordset
    Dim weather As Recordset
    Dim canalforc As Recordset
    Dim distforc As Recordset
    Dim logs As Recordset
    Dim dates As Date
    Dim p, pp, yy, cyy As Integer
    Dim cl, Ingh As Integer
    Dim cr As Integer
    Dim i, j, k, l, fyear, fperiod, lyear, lperiod, lj, cp, ll As Integer
    Dim kcarea, carea, et, rf, sumdist, sumclwr, clwr, mn As Double
    Dim c_coeff As Single
    Dim sumocwr, prevcurr, ocwr As Double
    Set mydb = CurrentDb
    Set current = mydb.openrecordset("current_crop")
    Set expected = mydb.openrecordset("expected_crop")
    Set crop = mydb.openrecordset("crops")
    Set canal = mydb.openrecordset("canals")
    Set coeff = mydb.openrecordset("coeff_crop")
    Set weather = mydb.openrecordset("weather")
    Set canalforc = mydb.openrecordset("canal_forecast")
    Set distforc = mydb.openrecordset("dist_forecast")
    Set logs = mydb.openrecordset("log")
    current.Index = "PRIMARYKEY"
    expected.Index = "PRIMARYKEY"
    crop.Index = "PRIMARYKEY"
    canal.Index = "PRIMARYKEY"
    coeff.Index = "PRIMARYKEY"
    weather.Index = "PRIMARYKEY"
    canalforc.Index = "PRIMARYKEY"
    distforc.Index = "primarykey"

    MsgBox "Calculating Water Requirement For Current Period"
    '-----
    ' Define first available data record for each crop/canal
    '-----
        logs.MoveFirst
        fyear = logs![fyear]
        fperiod = logs![fperiod]
    '-----
    ' start from the 14th record
    '-----
        ' ffperiod = fperiod + 14
    ' Beyond the 24th period, step to next year
    '-----
        ' If ffperiod > 24 Then

```

Table 8-4. (Continued).

```

' fperiod = fperiod + 14 - 25
' fyear = fyear + 1
' End If
'
'Define last available record for that crop/canal
'
lyear = logs![lyear]
lperiod = logs![lperiod]
'
'for each time period in historic crop file
'
    i = fyear
    Do While i < lyear + 1
        j = 1
        lj = 24
        If i = fyear Then
            j = fperiod
        End If
        If i = lyear Then
            lj = lperiod
        End If
        Do While j < lj + 1
            sumdist = 0
            canal.MoveFirst
        '
    'for each canal in canal db
    '
        Do While Not canal.EOF
            sumclwr = 0
            cl = canal![no]
            weather.MoveFirst
            weather.Seek "=", j
            If Not weather.NoMatch And Not weather.EOF Then
                et = weather![Reff_ET]
                rf = weather![Eff_Rain]
                lngth = weather![length]
            End If
        '
    'and every crop in crop db
    '
        crop.MoveFirst
        Do While Not crop.EOF
            sumocwr = 0
            kcarea = 0
            carea = 0
            cr = crop![Crop_ID]
            cp = crop![onoff]
            If cr = 10 Then Exit Do
            If cp = 1 Then
                coeff.MoveFirst
                coeff.Seek "=", cr, j
            If Not coeff.NoMatch And Not coeff.EOF Then
                c_coeff = coeff![coeff]
                ocwr = coeff![ocwr]
            End If
            current.MoveFirst
            current.Seek "=", i, j, cl, cr
            If Not current.NoMatch And Not current.EOF Then current.Edit
        
```

Table 8-4. (Continued).

```

clwr = (((c_coeff * et) - (rf / lnth)) / 0.7)

If current![area] > 0 Then
    clwr = clwr + (ocwr / lnth / current![area])
    mn = 50 / lnth
    If clwr > 0 And clwr < mn Then
        clwr = mn
    End If
    If clwr <= 0 Then
        clwr = 0
    End If
    current![two_weeks] = clwr *(current![area] * 4.2)
    Else
        current![two_weeks] = 0
        clwr = 0
    End If
    current![kc] = c_coeff
    current![kcavg] = c_coeff
    current![duty] = clwr
    clwr = current![two_weeks]
    current.Update
End If
' non perr.
Else
    For l = 13 To 1 Step -1
        ll = j - l + 1
        If ll < 1 Then
            ll = ll + 24
            yy = i - 1
        Else
            yy = i
        End If
    ' Seek for lagged kc in coeff. db
    -----
    coeff.MoveFirst
    coeff.Seek "=", cr, l
    If Not coeff.NoMatch Then
        c_coeff = coeff![coeff]
        ocwr = coeff![ocwr]
    End If
    weather.MoveFirst
    weather.Seek "=", j
    If Not weather.NoMatch Then
        et = weather![Reff_ET]
        rf = weather![Eff_Rain]
        lnth = weather![length]
    End If
    'Seek planting for 0-2 weeks forecast in current crop db.
    -----
    current.MoveFirst
    current.Seek "=", yy, ll, cl, cr
    If Not current.NoMatch And Not current.EOF Then
        kcarea = kcarea + (current![planting] * c_coeff)
        sumocwr = sumocwr + (ocwr * current![planting])
        carea = carea + current![planting]
        If i = yy And j = ll Then
            current.Edit
        If current![area] = 0 Then

```

Table 8-4. (Continued).

```

current![two_weeks] = 0
clwr = 0
Else
    If carea > 0 Then
        clwr = ((kcarea / carea * et) - (rf / lngh)) / 0.7
        current![kc] = kcarea / carea
    End If
    clwr = clwr + (sumocwr / lngh / current![area])
    If clwr < 0 Then
        clwr = 0
    End If
    mn = 50 / lngh
    If clwr < mn Then
        clwr = mn
    End If
End If
current![duty] = clwr
current![two_weeks] = clwr * (current![area]*4.2)
current![kcavg] = kcarea
clwr = current![two_weeks]
current.Update
End If
End If
Next l
End If
sumclwr = sumclwr + clwr
crop.MoveNext
Loop
canalforc.Seek "=", cl, i, j
If Not canalforc.NoMatch And Not canalforc.EOF Then
    canalforc.Edit
    canalforc![canal_id] = cl
    canalforc![year] = i
    canalforc![period] = j
    canalforc![forecast0] = sumclwr '* lngh) / 1000000
    canalforc.Update
Else
    canalforc.AddNew
    canalforc![canal_id] = cl
    canalforc![year] = i
    canalforc![period] = j
    canalforc![forecast0] = sumclwr '* lngh) / 1000000
    canalforc.Update
End If
sumdist = sumdist + sumclwr
canal.MoveNext
Loop
distforc.Seek "=", i, j
If Not distforc.NoMatch And Not distforc.EOF Then
    distforc.Edit
    distforc![year] = i
    distforc![period] = j
    distforc![forecast0] = sumdist ' * lngh ) / 1000000
    distforc.Update
Else
    distforc.AddNew
    distforc![year] = i
    distforc![period] = j

```

Table 8-4. (Continued).

```
distforc![forecast0] = sumdist' * lngh ) / 1000000
distforc.Update
End If
j = j + 1
Loop
i = i + 1
Loop
MsgBox "Calculations Completed"
End Function
```

Table 8-5. Expected water requirements calculation procedure.

```

Attribute VB_Name = "expected"
Option Compare Database
Option Explicit
Function expected_req()
    DoCmd.SetWarnings False
    Dim mydb As Database
    Dim current As Recordset
    Dim expected As Recordset
    Dim crop As Recordset
    Dim canal As Recordset
    Dim period As Recordset
    Dim coeff As Recordset
    Dim weather, canalforc, distforc, logs As Recordset
    Dim dates As Date
    Dim p, pp, yy, cyy As Integer
    Dim cl, lngth, cp As Integer
    Dim cr, newj, newi As Integer
    Dim i, j, k, l, lj, lyear, fyear, lperiod, fperiod, ll As Integer
    Dim karea, carea, et, rf, sumdist, sumclwr, clwr, mn As Double
    Dim c_coeff As Single
    Dim sumocwr, prevcurr, ocwr, expect_four As Double
    Set mydb = CurrentDb
    Set current = mydb.openrecordset("current_crop")
    Set expected = mydb.openrecordset("expected_crop")
    Set crop = mydb.openrecordset("crops")
    Set canal = mydb.openrecordset("canals")
    Set coeff = mydb.openrecordset("coeff_crop")
    Set weather = mydb.openrecordset("weather")
    Set canalforc = mydb.openrecordset("canal_forecast")
    Set distforc = mydb.openrecordset("dist_forecast")
    Set logs = mydb.openrecordset("log")
    current.Index = "PRIMARYKEY"
    expected.Index = "PRIMARYKEY"
    crop.Index = "PRIMARYKEY"
    canal.Index = "PRIMARYKEY"
    coeff.Index = "PRIMARYKEY"
    weather.Index = "PRIMARYKEY"
    canalforc.Index = "PRIMARYKEY"
    distforc.Index = "primarykey"
    MsgBox "Calculating Water Requirement For Next Period"
    '
    ' Define first available data record for each crop/canal
    '
    logs.MoveFirst
    fyear = logs![fyear]
    fperiod = logs![fperiod]
    '
    ' Beyond the 24th period, step to next year
    '
    ' ffperiod = fperiod + 12
    ' If ffperiod > 24 Then
    '     fperiod = fperiod + 12 - 25
    '     fyear = fyear + 1
    ' End If
    '
    ' Define last available record for that crop/canal
    lyear = logs![lyear]

```

Table 8-5. (Continued).

```

lperiod = logs![lperiod]
'-----
'for each time period in historic crop file
    i = fyear
    Do While i < lyear + 1
        j = 1
        lj = 24
        If i = fyear Then
            j = fperiod
        End If
        If i = lyear Then
            lj = lperiod
        End If
        Do While j < lj + 1
            weather.MoveFirst
            weather.Seek "=", j + 1
            If Not weather.NoMatch And Not weather.EOF Then
                et = weather![Reff_ET]
                rf = weather![Eff_Rain]
                lngh = weather![length]
            End If
        '-----
        'for each canal in canal db
        '-----
        sumdist = 0
        canal.MoveFirst
        Do While Not canal.EOF
            sumclwr = 0
            cl = canal![no]

        '-----
        ' and every crop in crop db
        '-----
        crop.MoveFirst
        Do While Not crop.EOF
            sumocwr = 0
            kcarea = 0
            carea = 0
            cr = crop![Crop_ID]
            cp = crop![onoff]
            If cr = 10 Then Exit Do
        '-----
        ' perrinials
        '-----
        If cp = 1 Then
            coeff.MoveFirst
            coeff.Seek "=", cr, j
            If Not coeff.NoMatch And Not coeff.EOF Then
                c_coeff = coeff![coeff]
                ocwr = coeff![ocwr]
            End If
            expected.MoveFirst
            expected.Seek "=", i, j, cl, cr
            If Not expected.NoMatch And Not expected.EOF Then
                expected.Edit
                clwr = (((c_coeff * et) - (rf / lngh)) / 0.7)
                If expected![area] > 0 Then
                    clwr = clwr + (ocwr / lngh / expected![area])
            End If
        End If
    End If
End If

```

Table 8-5. (Continued).

```

mn = 50 / lngh
If clwr > 0 And clwr < mn Then
    clwr = mn
End If
If clwr <= 0 Then
    clwr = 0
End If
expect_four = clwr * (expected![area] * 4.2)
Else
    expect_four = 0
    clwr = 0
End If
expected![four_weeks] = expect_four
expected![kc] = c_coeff
expected![kcavg] = c_coeff
expected![duty] = clwr
clwr = expected![four_weeks]
expected.Update

End If
'-----
' non perr.
'-----

Else
    For l = 11 To 0 Step -1
        ll = j - 1
        If ll < 1 Then
            ll = ll + 24
            yy = i - 1
        Else
            yy = i
        End If
    ' Seek for lagged kc in coeff. db
    '-----
        coeff.MoveFirst
        coeff.Seek "=", cr, l + 2
        If Not coeff.NoMatch Then
            c_coeff = coeff![coeff]
            ocwr = coeff![ocwr]
        End If

    'Seek planting for 0-4 weeks forecast in expected crop db.
    '-----
        current.MoveFirst
        current.Seek "=", yy, ll, cl, cr
        If Not current.NoMatch And Not current.EOF Then
            kcarea = kcarea + (current![planting] * c_coeff)
            sumocwr = sumocwr + (ocwr * current![planting])
            carea = carea + current![planting]
        End If
        Next l
        coeff.MoveFirst
        coeff.Seek "=", cr, 1
        If Not coeff.NoMatch Then
            c_coeff = coeff![coeff]
            ocwr = coeff![ocwr]
        End If
    End If
End If

```

Table 8-5. (Continued).

```

End If
expected.MoveFirst
expected.Seek "=", i, j, cl, cr
If Not expected.NoMatch And Not expected.EOF Then
    expected.Edit
    kcarea = kcarea + (expected![expplant] * c_coeff)

    sumocwr = sumocwr + (ocwr * expected![expplant])
    carea = carea + expected![expplant]
    If expected![area] = 0 Then
        expect_four = 0
        clwr = 0
    Else
        If carea > 0 Then
            clwr = ((kcarea / carea * et) - (rf / length)) / 0.7
                expected![kc] = kcarea / carea
        End If
        clwr = clwr + (sumocwr / length / expected![area])
        If clwr < 0 Then
            clwr = 0
        End If
        mn = 50 / length
        If clwr < mn Then
            clwr = mn
        End If
        expect_four = clwr * (expected![area] * 4.2)
        expected![duty] = clwr
        expected![four_weeks] = expect_four
        expected![kcavg] = kcarea / carea
        clwr = expect_four
        expected.Update
    End If
End If
End If
sumclwr = sumclwr + clwr
crop.MoveNext
Loop
'-----'
'Update canal Forecast(canal_forecast table), put forecast of next period in current record
'-----'
canalforc.Seek "=", cl, i, j
If Not canalforc.NoMatch And Not canalforc.EOF Then
    canalforc.Edit
    canalforc.forecast1 = sumclwr * length) / 1000000
    canalforc.Update
Else
    canalforc.AddNew
    canalforc.canal_id = cl
    canalforc.year = i
    canalforc.period = j
    canalforc.forecast1 = sumclwr * length) / 1000000
    canalforc.Update
End If
'-----'
'Put same data in another field, such that next period's canal forecast
'is put in the next period's record
'-----'

```

Table 8-5. (Continued).

```

canalforc.MoveFirst
If j = 24 Then
    canalforc.Seek "=", cl, i + 1, 1
Else
    canalforc.Seek "=", cl, i, j + 1
End If
If Not canalforc.NoMatch Then
    canalforc.Edit
    canalforc.for_shift = sumclwr

If i = lyear And j = lperiod Then
    canalforc.forecast0 = sumclwr
End If
canalforc.Update
Else
    If j = 24 Then
        newj = 1
        newi = i + 1
    Else
        newi = i
        newj = j + 1
    End If
    If i = lyear And j = lperiod Then
        canalforc.AddNew
        canalforc.canal_id = cl
        canalforc.year = newi
        canalforc.period = newj
        canalforc.for_shift = sumclwr
        canalforc.forecast0 = sumclwr
        canalforc.Update
    End If
End If
sumdist = sumdist + sumclwr
canal.MoveNext
Loop
'-----'
'Update district Forecast(dist_forecast table), put forecast of 'next period' in current record
'-----'
distforc.MoveFirst
distforc.Seek "=", i, j
If Not distforc.NoMatch And Not distforc.EOF Then
    distforc.Edit
    distforc.forecast1 = sumdist ' * lnghth ) / 1000000
    distforc.Update
Else
    distforc.AddNew
    distforc.year = i
    distforc.period = j
    distforc.forecast1 = sumdist ' * lnghth ) / 1000000
    distforc.Update
End If
'-----'
' Put same data in another field, such that next period's district
' forecast is put in the next period's record
'-----'
distforc.MoveFirst
If j = 24 Then
    distforc.Seek "=", i + 1, 1

```

Table 8-5. (Continued).

```
Else
distforc.Seek "=", i, j + 1
End If
If Not distforc.NoMatch Then
    distforc.Edit
    distforc.for_shift = sumdist
    If i = lyear And j = lperiod Then
        distforc.forecast0 = sumdist
    End If
    distforc.Update
Else
    If j = 24 Then
        newj = 1
        newi = i + 1
    Else
        newi = i
        newj = j + 1
    End If
    If i = lyear And j = lperiod Then
        distforc.AddNew
        distforc.year = newi
        distforc.period = newj
        distforc.for_shift = sumdist
        distforc.forecast0 = sumdist
        distforc.Update
    End If
    End If
    j = j + 1
Loop
i = i + 1
Loop
MsgBox "Calculations Completed"
End Function
```

Microsoft Access - [dist_gn5 : Form]

File Edit Tools Data Entry Calculate Planning Calculate Water Requirements Display Results Reports Window Help

MISD Results For Abo Hominos District

Reports / Results

- Cropping Pattern
- Canal Forecast
- District Forecast
- Seasonal Statistics

Start Date End Date

2001 2001

Period No. 1 Of Year
2001

Period No. 12 Of
Year 2001

PRINT

PRINT PREVIEW

Form View

This screenshot shows a Microsoft Access form titled 'MISD Results For Abo Hominos District'. At the top, there's a navigation bar with standard menu items like File, Edit, Tools, etc. Below the title, there's a section labeled 'Reports / Results' with four radio button options: 'Cropping Pattern', 'Canal Forecast' (which is selected), 'District Forecast', and 'Seasonal Statistics'. To the right of this section are two dropdown menus for 'Start Date' and 'End Date', both currently set to '2001'. Below these dropdowns are two text boxes: 'Period No. 1 Of Year' containing '2001' and 'Period No. 12 Of Year' containing '2001'. On the far right, there are three buttons: 'PRINT', 'PRINT PREVIEW', and a small icon with a green arrow.

Figure 8-9. Canal forecast report parameters (start date and end date).

Table 8-6. Canal forecast report, period 1 (January 1-15), 2001.

Canal Water Needs Forecast					
No.	Canal	Year	Period	Current	Expected
1	Abo Tahoон	2001	1	43470.00	40753.13
2	Berket Attas	2001	1	34664.00	32497.50
3	Besntway	2001	1	46130.00	43246.88
4	Elahkar	2001	1	5880.00	5512.50
5	Eldekhla	2001	1	59290.00	55584.38
6	Elgaradat	2001	1	18298.00	17154.38
7	Elhamamy	2001	1	53354.00	50019.38
8	Elherfa	2001	1	111426.00	104461.88
9	Elkamaheen	2001	1	68054.00	63800.63
10	Elkarawy	2001	1	25354.00	23769.38
11	Elkasida	2001	1	6860.00	6431.25
12	Elkenawia	2001	1	120484.00	112953.75
13	Elnakhla	2001	1	16674.00	15631.88
14	Elsharkawa	2001	1	25830.00	24215.63

Table 8-6. (Continued).

Canal Water Needs Forecast (Continued)					
No.	Canal	Year	Period	Current	Expected
15	Elwzara	2001	1	29960.00	28087.50
16	Elzarka	2001	1	50176.00	47040.00
17	Elzeny	2001	1	58646.00	54980.63
18	G Kabeel	2001	1	5320.00	4987.50
19	G sahaly	2001	1	15428.00	14463.75
20	Gnady	2001	1	21924.00	20553.75
21	Hamdy	2001	1	4270.00	4003.13
22	Kafla	2001	1	51926.00	48680.63
23	Khadra	2001	1	3360.00	3150.00
24	Koom Elbous	2001	1	32900.00	30843.75
25	Mahlt Keel	2001	1	58226.00	54586.88
26	Sahaly	2001	1	22428.00	21026.25
27	Seaf Aldeen	2001	1	7210.00	6759.38
28	Sidi Azab	2001	1	23660.00	22181.25
29	Zawet Naem	2001	1	24850.00	23296.88

Page 2 of 2

پناہ، 29 2002

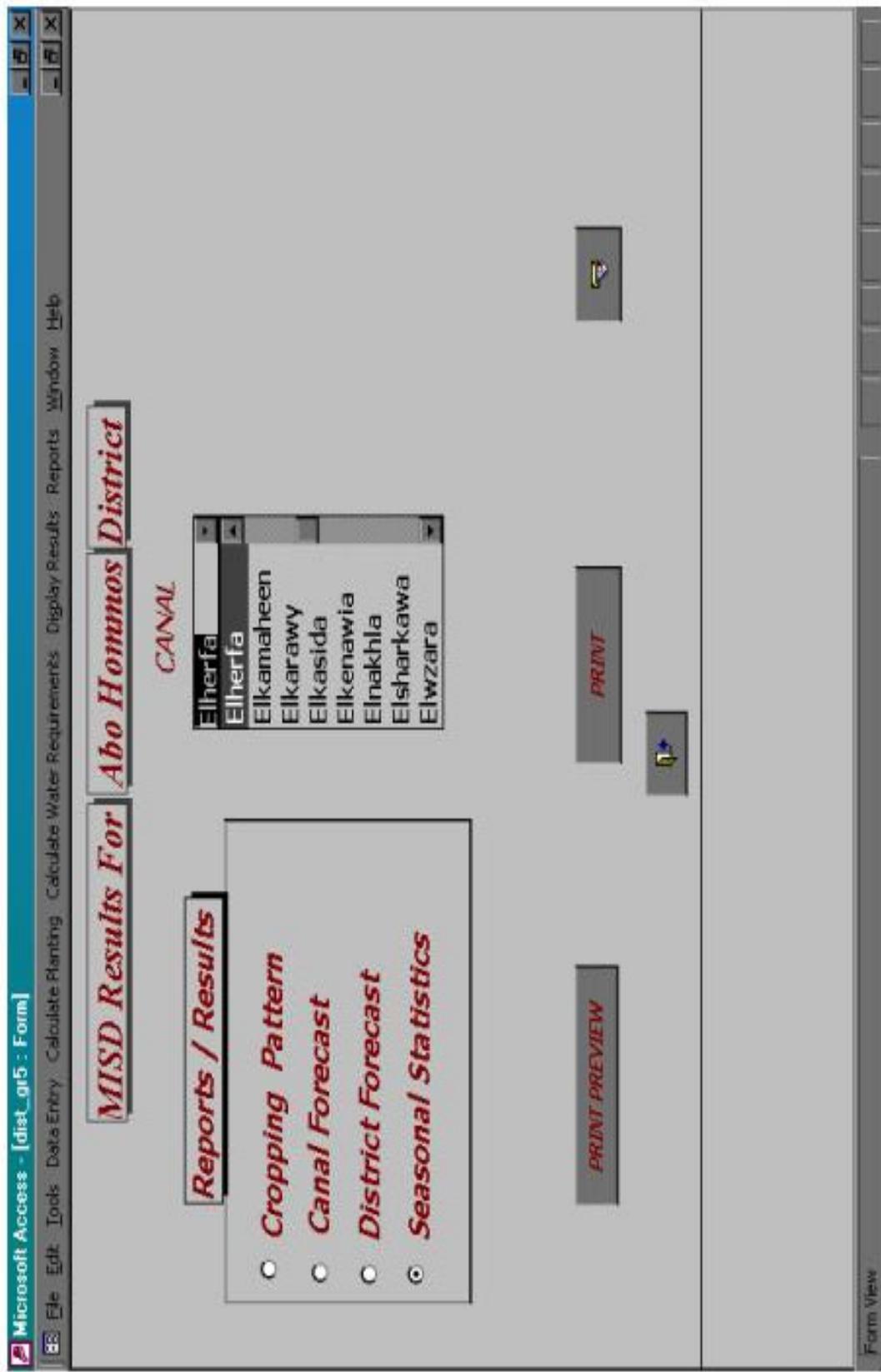


Figure 8-10. Seasonal statistics report parameters (canal name).

Table 8-7. Seasonal statistics report.

<i>Water Requirements Statistical Report</i>							
Canal	Per	Current			Expected		
		Average	Min	Max	Average	Min	Max
Elherfa	1	111426.00	111426.00	111426.00	104461.88	104461.88	104461.88
Elherfa	2	104461.88	104461.88	104461.88	104461.88	104461.88	104461.88
Elherfa	3	111466.38	111466.38	111466.38	111466.38	111466.38	111466.38
Elherfa	4	130585.90	130585.90	130585.90	130585.90	130585.90	130585.90
Elherfa	5	149739.24	149739.24	149739.24	149739.24	149739.24	149739.24
Elherfa	6	153340.83	153340.83	153340.83	154119.61	154119.61	154119.61
Elherfa	7	141345.21	141345.21	141345.21	145557.35	145557.35	145557.35
Elherfa	8	33827.17	33827.17	33827.17	29915.36	29915.36	29915.36
Elherfa	9	23810.72	23810.7	23810.72	45395.42	45395.42	45395.42
Elherfa	10	63160.25	63160.25	63160.25	58013.02	58013.02	58013.02
Elherfa	11	116117.09	116117.09	116117.09	78892.95	78892.95	78892.9529
Elherfa	12	261989.15	261989.15	261989.15	282525.99	282525.99	282525.99
Elherfa	13	349110.94	349110.94	349110.94	349110.94	349110.94	349110.94
Elherfa	14	481983.38	481983.38	481983.38	370153.24	370153.24	370153.24
Elherfa	15	0.00	0.00	0.00	0.00	0.00	0.00
Elherfa	20	59968.75	59968.75	59968.75	0.00	0.00	0.00
Elherfa	21	111426.00	111426.00	111426.00	55300.00	55300.00	55300.00
Elherfa	22	111426.00	111426.00	111426.00	111426.00	111426.00	111426.00
Elherfa	23	111426.00	111426.00	111426.00	111426.00	111426.00	111426.00
Elherfa	24	104461.88	104461.88	104461.88	104461.88	104461.88	104461.88

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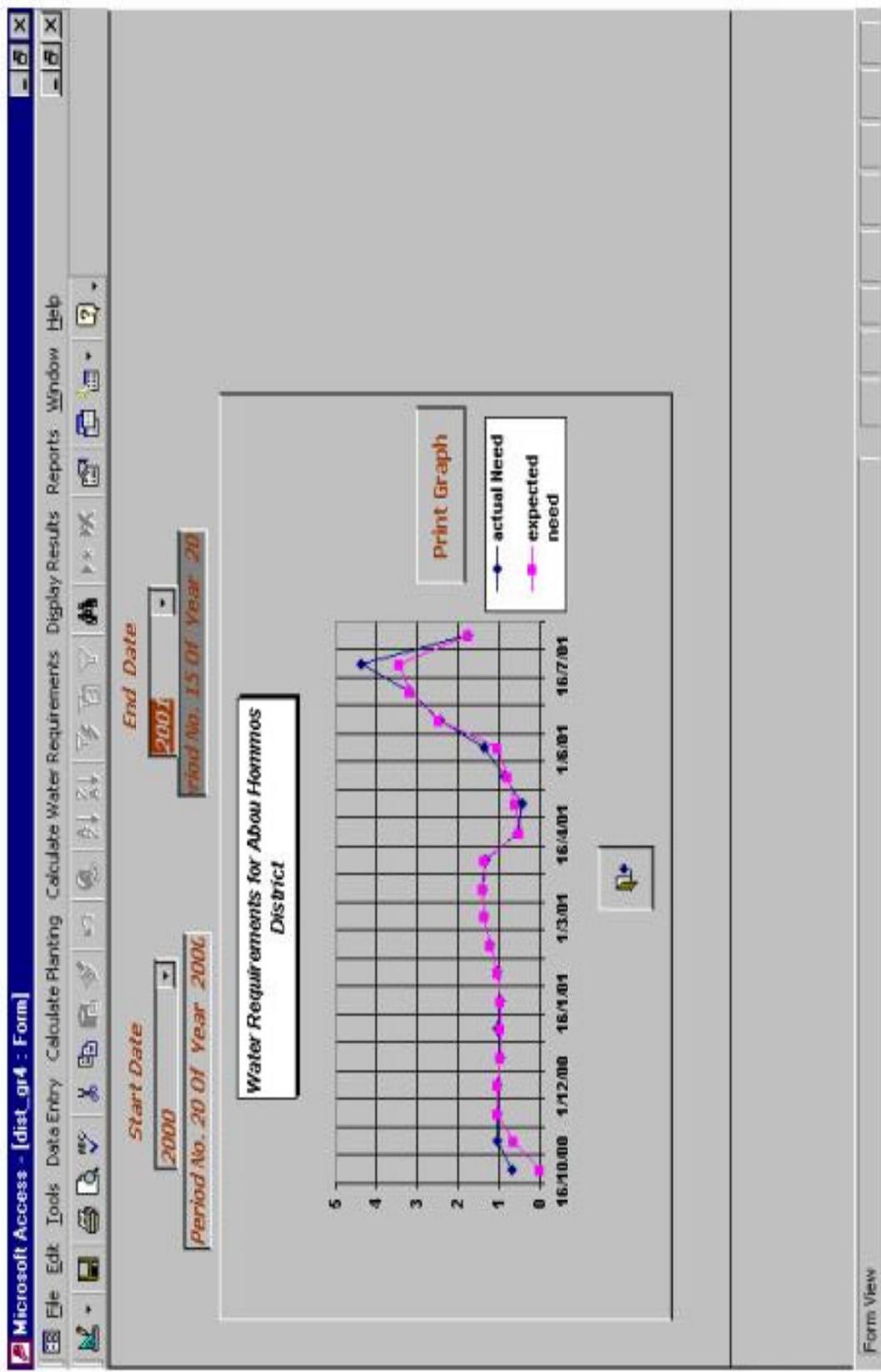


Figure 8-11. Comparison of actual and expected needs.

Table 8-8. Time series of current and expected crop water needs for the Abou Hummus Irrigation District.

<i>Abou Hummus District Forecast</i>				
Year	Period	Current Need	Next Period Expected Need (Million m³)	Expected Need (Million m³)
2000	20	0.69	0.66	0.00
2000	21	1.05	1.05	0.66
2000	22	1.05	1.05	1.05
2000	23	1.05	0.98	1.05
2000	24	0.98	0.98	0.98
2001	1	1.05	0.98	0.98
2001	2	0.98	1.05	0.98
2001	3	1.05	1.22	1.05
2001	4	1.22	1.34	1.22
2001	5	1.34	1.39	1.34
2001	6	1.39	1.37	1.39
2001	7	1.31	0.52	1.37
2001	8	0.54	0.62	0.52
2001	9	0.41	0.79	0.62
2001	10	0.84	1.03	0.79
2001	11	1.36	2.45	1.03
2001	12	2.42	3.20	2.45
2001	13	3.20	3.32	3.20
2001	14	4.36	3.48	3.32
2001	15	3.48	0.00	3.48

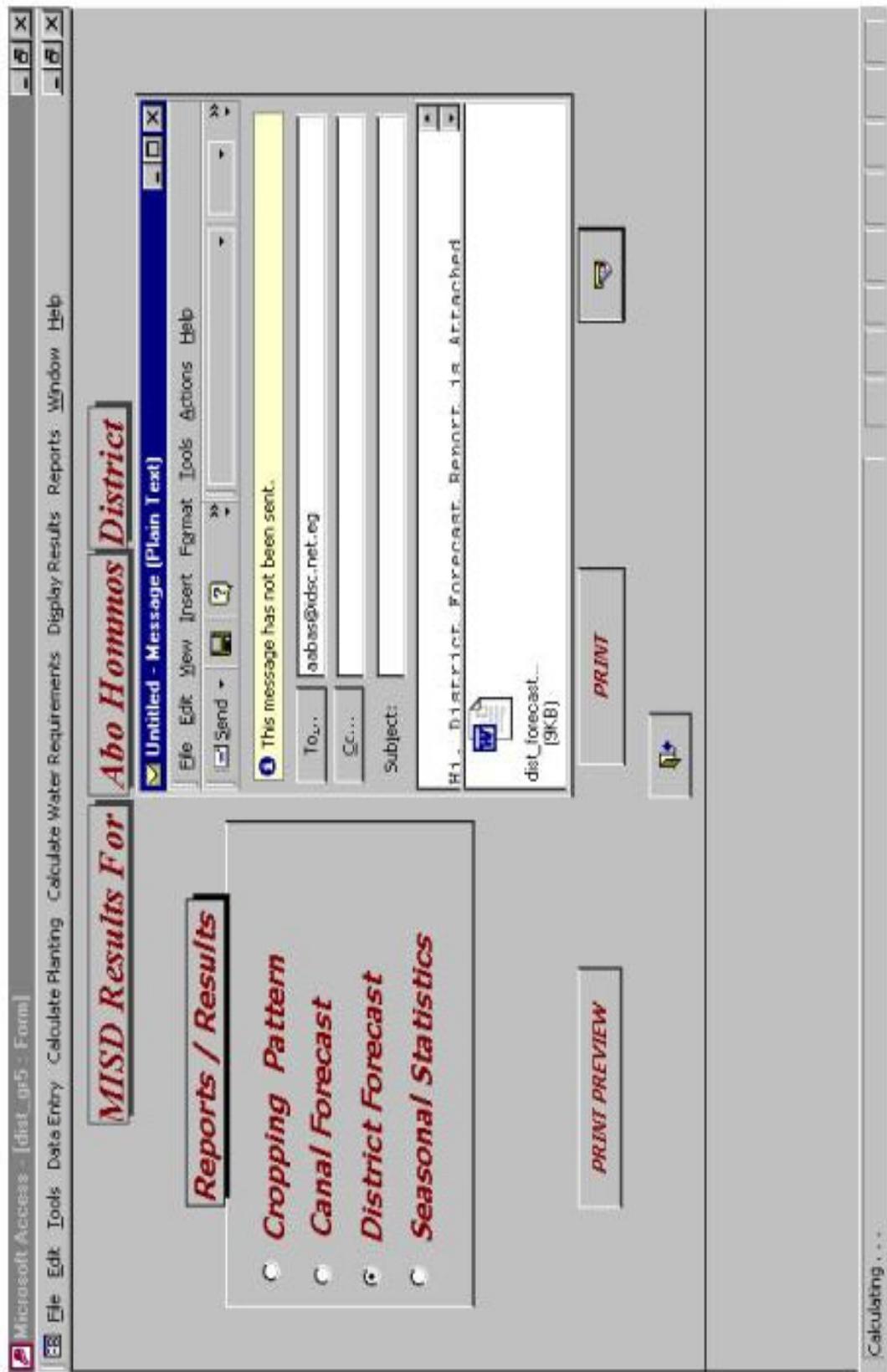


Figure 8-12. District to directorate data transfer example for sending district historic crop water needs.

